BUILDING
CENTRAL PACIFIC RAILROAD
1860 - 1865

PRELIMINARY SURVEY, 1861
T. D. JUDAH

PROGRESS OF CONSTRUCTION, 1864
S. S. MONTAGUE

PROGRESS OF THE WORK, 1865
LELAND STANFORD

Accessions No. [illegible] Received

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No 1.

PACIFIC RAILROAD.

1860

REPORT

OF

THEODORE D. JUDAH,

ACCREDITED AGENT PACIFIC RAILROAD CONVENTION,

UPON HIS

OPERATIONS IN THE ATLANTIC STATES.

SAN FRANCISCO:
AUGUST, 1860.

CALIFORNIA STATE LIBRARY
CALIFORNIA SECTION

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SAN FRANCISCO:
AUGUST, 1860.

REPORT.

To the Executive Committee Pacific Railroad Convention:

GENTLEMEN: Appointed by you, October 11, 1859, to bear to Washington and present the memorial of your Convention to the President, heads of Department and Congress; to act as the representative of the Convention in Washington, and to bring all possible legitimate influence to bear to secure favorable Congressional action on a Pacific Railroad Bill, I have the honor to present the following report of my proceedings, trusting it may meet your approval:

It will be remembered that in their consideration of the subject, the Convention concurred in adopting three resolutions which seemed to embody all the general principles necessary for a plan to carry out the work, to wit:

That the General Government should guarantee, under such restrictions and safeguards as might be necessary to prevent fraud, five per centum per annum upon the actual cost of the road to the parties constructing the same.

That Government should grant the right of way for the road across the Territories, and the party or company undertaking its construction should be left at liberty to select such route as they might deem for their interests.

That the State of California would undertake the construction of that part of the road within her limits.

The Convention also expressed a preference for what is known as the Central route, and recommended in their memorial some further details of minor importance.

Keeping in view these general principles, I proceeded to frame a bill in accordance therewith, a copy of which accompanies this report. A copy of the same was forwarded to California, and was indorsed and approved by the Convention at its second session in Sacramento.

On my passage to the East, being accompanied by Mr. Burch, our newly elected Congressman; also, General Lane, Senator from Oregon, I lost no time in endeavoring to impress upon these gentlemen the views of the Convention. Mr. Burch became thoroughly conversant with the action of the Convention, with whom the various provisions of the bill were carefully discussed. He manifested a regard and solicitude for our proceedings and future interests, which were fully evinced by his subsequent action in Washington. He agreed to

adopt our bill, present it to Congress and work for it, as the bill of the Convention emanating from and expressing the wishes and views of the people of California upon the subject. The bill was also presented to General Lane, who approved of it. Upon my arrival in New York I had the bill printed, also an explanatory circular (copies of which accompany, marked B and C), which were forwarded to California to Messrs. Gwin and Scott, and to the principal newspapers and prominent individuals particularly interested in the subject in our State and various other States.

Interviews were also had with various influential men in New York city and Boston on the subject.

December 3d I visited Washington, communicated with Messrs. Gwin, Scott and Burch on the subject, and endeavored to prevail on Mr. Gwin to substitute our bill for his, and present it to the Senate as the bill of the Convention. He examined the bill section by section, and although he considered some of its provisions objectionable, yet on the whole he approved of it; said that the ideas it contained were very similar to his own, and, if it could be passed as proposed, regarded it in some respects preferable to his own, but he had that morning introduced his own bill in the Senate. He stated that his own was the bill before the Senate at the last session; that it had been thoroughly discussed by that body; that it had been acted upon by the Committee, and embodied the amendments of various Senators; that the Senate was perfectly familiar with its provisions; and so much work had been done upon it, he thought it would be easier to pass it than the bill of the Convention, which was new, and would render prolonged discussion unavoidable. He expressed himself decidedly for it if it found favor and could be more easily passed than his own. His bill having been introduced and placed on the calendar as before stated, he suggested that Mr. Haun should introduce our bill also, and place it on the calendar, and that when the subject should come up he would work for the one which appeared to find most favor.

December 6th, Messrs. Gwin, Burch and Scott accompanied me to the President, with whom an interview was had. The nature of my business was explained, and agreeably to my instructions I presented the memorial and proceedings of the Convention to the President. He received them graciously, and expressed himself generally in favor of a Pacific Railroad.

Finding that the House would probably be occupied some time in the election of Speaker, and that no business could be transacted before that body, in the meantime I decided to make a tour through the West, and endeavor to awaken as much interest as possible in our efforts. Before the organization of Congress I accordingly visited New York, Albany, Syracuse, Buffalo, Cleveland, Columbus, Chicago and Cincinnati, being absent about one month, and arrived in Washington again January 14, 1860. Since which time I have been constantly engaged in endeavoring to further the passage of a Pacific Railroad Bill.

On consultation with Mr. Burch, at the suggestion of other members, it was decided to make some alterations in the bill, which was accordingly done. The bill was again printed, and also a circular explaining its features. I sent a copy of this bill and circular (marked D and E) to each member of Congress, and also to prominent newspapers and individuals throughout the country.

The Speaker of the House being chosen, the first business affecting our interests was the formation of Committees. I exerted myself with other friends to procure, among others, the appointment of Mr. Burch upon the Special Committee on Pacific Railroad. It soon became apparent that there was a great pressure on the Speaker for these positions. Parliamentary usage generally conceding the Chairmanship of a Special Committee to the member who first moves the Committee, or offers a bill and proposes its reference to a Committee to be appointed by the Speaker. Several attempts were made by members to this end, but the House seeming determined to act cautiously in the matter, these attempts were defeated by the bills being referred to Standing Committees, as the record of proceedings of February 15th and 16th will show. Mr. Scott introduced the Wigfall Pacific Railroad Bill, and moved its reference to a Select Committee, but it was referred to the Committee on Military Affairs. Mr. Farnsworth, Mr. Fenton and Mr. Curtis severally made similar ineffectual attempts.

February 16th, Mr. Burch introduced our bill and memorial and asked its reference to a Select Committee. Objection being made, he asked for the ayes and noes, on which the motion was lost. The matter was referred to the Committee on Post Offices and Post Roads, by which a point was gained, that Committee being friendly to our bill. Mr. Craig, of Missouri, on the Committee, agreed to procure its reference to himself, and to report it favorably. Finally, on the 5th of March, Mr. Sherman moved a Select Committee of fifteen, and that all the bills and memorials on the subject be referred to it, stating at the time that he did not desire the Chairmanship. The motion was carried.

I immediately saw the Speaker and explained to him the action of our Convention, our position and views. He assured me California and Oregon should be represented on the Committee, but could not say which of the delegates would be appointed, as the wishes of the Chairman was entitled to consideration, and would be consulted in the matter.

On the 14th March, the Speaker announced the following as the Committee, viz: Messrs. Farnsworth, Illinois; Phelps, Missouri; H. W. Davis, Maryland; Scott, California; Rice, Massachusetts; Fenton, New York; William Smith, Virginia; Taylor, Louisiana; Kellogg, Michigan; Blair, Pennsylvania; Aldrich, Minnesota; Hamilton, Texas; French, Maine; Stout, Oregon. Mr. Hindman, of Arkansas, was subsequently added to the Committee, increasing the number to sixteen.

The first meeting of the Committee was on March 15, 1860. A full copy of the proceedings of the Committee (marked "F") accompanying.

Mr. Scott having been appointed on the Committee, my future business operations with the Select Committee were of course through him. I cheerfully bear witness to his uniform interest and zeal on the subject, and can testify to his earnest endeavors to further our views and promote a general good feeling and harmony of action on the question of the Pacific Railroad.

Mr. Scott regarded the action of the Convention with respect and consideration, and was willing to work for any measure or bill which would give us a road. He immediately put me in communication with the members of the Committee, took me to see the Chairman, Mr. Curtis (with whom we had a long and satisfactory interview), and furnished me with the earliest information of the meetings of the Committee and its action. He also availed himself of every opportunity to introduce me to members friendly to the passage of the Pacific Railroad Bill.

My first business being to place the action and bill of the Convention before the Committee, and to procure its adoption, I sent each of them a copy of our proceedings and bill, and visited most of them personally, so that they might become thoroughly conversant with our action in California. I then prepared a letter (copy accompanying marked "G"), urging on the Committee their adoption of our views, which letter was presented by Mr. Scott, read in Committee and placed on file.

There being at this time many propositions and bills for a Pacific Railroad, emanating from different quarters—there being no less than four from the Pacific coast—and it being desirable that there should be some sort of unanimity of action, particularly from the Pacific coast, a meeting of the delegation (to which I was invited) was had, including Messrs. Latham, Gwin, Scott, Lane, Stout and Stevens, at which it was decided to drop all plans and bills until the Special Committee had matured a bill—to take that bill, no matter in what shape, work for and endeavor to pass it. It was believed at this time that the Select Committee would make an early report.

The indications being that the Committee would report a bill for one route; and afraid that if they attempted to locate that route it would result in serious trouble and perhaps defeat the bill, I endeavored, during the progress of Committee sessions, to prevail upon them, after locating termini, to leave the location of the route open, and it was pretty much decided to do so. But, inasmuch as it gave an opportunity for the Albuquerque or thirty-fifth parallel route to compete, the friends of both the Southern and Central route *via* Salt Lake united against it. This route was ably advocated by Hon. Mr. Phelps, of Missouri. The bill, as decided upon by Committee, fixed its western terminus on the navigable waters of the Sacramento river, or Bay of San Francisco, and did not contemplate its extension to the city of

San Francisco. This gave to the Central route an apparent advantage of 150 to 200 miles in length, as its length would be calculated only to Red Bluffs or vicinity. Mr. Phelps deemed this unfair, and argued that inasmuch as the corporators or trustees had been named generally from States known to be favorable to the Central or Salt Lake route; that inasmuch as the eastern termini had been decided upon to be two points severally on the western borders of Iowa and Missouri, the lines from which, uniting in two hundred miles, and thence proceeding by a main trunk westward, and as this was almost equivalent to fixing it upon the Central route, he insisted that the words "or city of San Francisco" be inserted, so as to establish something like an equality at the western end. He stated that he was willing that the friends of the Central route should name the corporators and fix the eastern termini, and he would be perfectly satisfied to take his chances, even against all these advantages, of showing his to be the nearest, best and cheapest route to the city of San Francisco, and finally succeeded in having San Francisco inserted by a vote of six to four. This controversy exciting some partisan feeling as to routes, at a subsequent meeting a motion to insert the words "*via* Salt Lake or vicinity" was, after much discussion, adopted by a vote of eight to six. Mr. Phelps then moved to further amend by adding the words "or to the mouth of the Columbia river." Mr. Stout moved to amend the amendment by inserting "to Vancouver in Washington Territory, or to Portland, Oregon." Mr. Stout's amendment to the amendment was adopted by a vote of ten to two.

The question then recurring upon Mr. Phelps' proposition, it was lost by a vote of five to nine.

I regarded this action as unfortunate, as it gave the bill a sectional aspect; it displeased the extreme North and evoked the opposition of the friends of both the thirty-fifth and thirty-second parallel. On consultation with Mr. Curtis, he became satisfied that the interests of the Central route were sufficiently protected by the eastern termini and corporators, and did not feel disposed to press the matter.

In order to obviate this difficulty—and Mr. Gwin stating that he could pass the Curtis bill in the Senate, if restored as it originally stood, leaving the route open—a new bill (copy of which accompanying is marked "G") was framed, substantially the same with that of Mr. Curtis, but leaving the route open and reducing the amount of Government aid to $50,000,000. Dr. Gwin agreed to procure its introduction in the Senate, to endeavor to call it up immediately and pass it, giving it preference over all other bills in the Senate, his own included.

Hon. Mr. Kennedy, of Maryland, took charge of and introduced it, and it was the general opinion that it would pass the Senate in that shape.

Mr. Curtis, after examining the bill, told me it would be quite satisfactory to him if the Senate would pass it in that shape.

Unfortunately for us, an opportunity to call up the subject in the Senate had not occurred when I left Washington. The cessation of business during the Charleston Convention, the debate upon the slavery question, and other matters of little moment to us, left no time for the consideration of the Pacific Railroad Bill, although it was the first bill introduced in Congress this session, and stands No. 1 on the calendar.

The House Committee having finished their labors, the Chairman was authorized to present the bill and report, but meantime Mr. Curtis had become convinced that it was best to strike out the words "Salt Lake," and by mistake, in printing the bill and report, the printer left out these words, and it was generally supposed that this was the intention of the Committee; but at a final meeting of the Committee, the morning of its consideration by the House, Mr. French, of Maine, called attention to it, and denounced it as a mutilation, declaring his intention to oppose the bill and everything connected with it unless it was restored. The mistake of the printer having placed Mr. Curtis in an embarrassing position, there being no time for discussion again, the words were restored by a vote of seven to six.

I saw Mr. French an hour afterward in the House. Had a long conversation with him on the subject, and he told me that now as it was restored he really cared very little about it; he opposed it simply because it did not truly represent the action of the Committee; it was incorrect, and no one had a right to present the bill except as it left the Committee; not if every member had informally acquiesced; it should be done officially. These were the motives which induced his course in this regard.

Accompanying (marked "E") will be found a record of the debates in the House on this subject.

Considerable difficulty was experienced in procuring an opportunity to report to the House, as some of the members carried their opposition so far as to seek occasion to interpose objections, declaring publicly their intention to resist not only its passage, but to prevent its consideration by all means within their power.

Under the rules of the House a single objection carries a bill, resolution or report over to the following day, when another objection may be made, and so on from day to day, thereby preventing its consideration. This may occur on any day but Monday, which is called suspension day, when (a member objecting) a suspension of the rules may be called for, which, if sustained by a two-thirds vote, allows a consideration of the subject.

After the Committee had matured their bill, Mr. Curtis made several ineffectual attempts to report, but the intervening Conventions and vigilance of those opposed prevented until Monday, May 13th, when under a suspension of the rules he obtained leave to report, and the bill was made a special order for Thursday, May 24th, at which time it came up for consideration, and was discussed. Friday being private

bill day, it was postponed until Monday and made the special order for Monday and Tuesday, 28th and 29th, and Mr. Curtis gave notice that he would call the previous question on Tuesday afternoon at four P. M.

It might not be inappropriate to present here a history of the debate, showing the progress made in settling upon details; but as the debates speak for themselves, are published and matters of record, I refer to the accompanying record of the proceedings of the House for the 24th, 28th and 29th of May, when it will be seen that the bill was recommitted, with a view of reconciling in Committee the differences which were embarrassing and delaying it in the House.

Those members who were unable to obtain a vote sustaining their amendments to the bill, knowing that a recommittal opened it again to amendment in the Committee, made a vigorous effort to prevent the previous question being called at the time fixed upon by the Chairman and tacitly agreed to by the House. As usual in such cases these members were disposed to magnify the difficulties and dangers surrounding its passage.

Many opposed to the passage of the bill encouraged lengthy discussion on its details, and themselves consumed a large share of the valuable time allotted to its consideration, with apparently no further object than to consume time—so that, on the arrival of the hour for the previous question, the bill would be found but imperfectly considered. As a natural consequence, when the time arrived, Mr. Curtis' call was met with the objection that by far the largest portion of the bill had not been discussed—that it might be faulty, and ought not to to be so hastily pressed to a vote. Mr. Curtis then endeavored ineffectually to have the time for consideration extended. An attack was then made upon some of its provisions by H. Winter Davis, a member of the Committee, and Mr. Millson, of Virginia—raising grave doubts in the minds of many members as to an important section—and a motion to recommit was made. This was opposed by Mr. Curtis and several of the friends of the bill, and Mr. Sherman warned the friends of the bill that, if they allowed it to be recommitted, the pressure of important business would prevent its being again reported, and would carry it over to the next session. The hour having arrived for final determination of this great question, which had agitated the public mind so many years, involving the appropriation of so large an amount of money, with all its various and important results and responsibilities staring them in the face, the objections urged by Messrs. Davis and Millson had peculiar force and weight in the minds of many members really friendly to the bill, and it was evident that a strong feeling had been aroused favorable to its recommitment, which being pressed, Mr. Curtis endeavored to procure the motion accompanied with instructions and leave to report on a specified day. In the general excitement and confusion this was misunderstood by many friends of the bill as a yielding of consent on the part of the Chairman to its recommitment. They therefore voted aye, and it was recommitted by a vote of 101 to 87.

Those opposed to the bill manifested great satisfaction at their success, considering it as defeated for the session. Its friends, although some discouraged, were not disheartened, and determined to have it before the House again.

I saw Mr. Curtis immediately after the disposal of the bill, and he decided to call the Committee together again the following day. Mr. Burch saw Mr. Davis, who stated that he was not an opponent of the Pacific Railroad, but would sit down with Mr. Curtis and try to harmonize their views. Mr. Burch and myself had an interview with Mr. Curtis that evening, and he expressed a willingness to meet the gentleman whose views differed on the provisions of the bill and to so reconcile the objections so as to be able to present the bill again, when it would be likely to pass without further delay. We also saw other gentlemen who had proposed amendments, and who agreed to help to get it before the House again.

At the following meeting of the Committee, an amendment offered by Mr. Fenton, obviating the objection of Mr. Davis, was adopted, and the opposition of the friends of a Southern route was reconciled by the insertion of a Southern route, which rendered the bill generally acceptable.

A motion to report the bill again with these amendments was, at a subsequent meeting, carried, and the passage of the bill was universally conceded, in case it could be again gotten before the House.

The House having dispatched most of its important business, and the desire for the passage of the bill being very general, the Committee were again given leave to report.

A record of the proceedings of Congress will show that when it came up, the Chairman asked that it be postponed until the third Tuesday in December next.

Among the views which influenced Mr. Curtis to take this course will probably be found the fact that the postponement of the bill to a fixed time in the next session, makes it a special order for that time, and it comes before the House in the same position in which it stood at the close of this session; so that the work done upon it in Committee is all saved; it will not have to go into Committee again; and I am sustained by the views of many intelligent gentlemen of experience in the opinion that, with proper exertion, there is little doubt of the passage of the bill at the short session.

Mr. Curtis approved of so arranging the details of the bill that instead of stopping at the eastern boundary of California, the road should run to the navigable waters of the Sacramento river, or the city of San Francisco, and provided that Government aid should be extended to that portion of the road within the limits of the State. That this was a judicious and wise provision is apparent when we consider that in order to construct the road within the time contemplated in the bill, it is absolutely necessary that its western terminus should be located on navigable waters, as the supplies of iron and material must be carried out from each end. The work of construction must be

prosecuted *pari passu* from either termini, or the work performed in the interior cannot otherwise receive its iron and material.

The amount of aid decided upon by Mr. Curtis for that portion of the road within the limits of the State was $12,000 per mile eastwardly to the base of the Sierra Nevada Mountains, and $24,000 per mile from the base of the mountains eastwardly, with an addition of $3,000 per mile for each degree of longitude, until the 109th degree was reached. I endeavored to prevail upon Mr. Curtis to increase this to $18,000 per mile, in view of the increased cost of roads in California, but could not induce him to alter it until the day it was last considered in the House, when he agreed to do so, and stated that an amendment to that effect might be offered in the House and he would accept it. The feature of the bill provides assistance for our local roads running in that direction, which assistance may possibly never be obtained in any other manner.

The bill is a very fair one. It contemplates a liberal donation or loan of United States bonds; it provides for the construction of two roads, and gives us a local road in California, which must be immediately constructed, extending from the southern line of the State through our fertile valleys, possibly to the headwaters of the Sacramento river.

It will be observed that the amount of land donated to the road is small, the reason for which is found in the fact that the Republican party have adopted the policy indicated in the Homestead Bill, and are generally opposed to the granting of lands in large bodies to any company for any purpose whatever. The amount of land originally intended to be taken was greater; but upon consultation with them it was found that a liberal donation of lands would constitute a serious impediment to the passage of the bill. They were willing, however, that in lieu thereof an increased amount of Government Bonds should be given, and aid of this kind was considered more desirable than a larger donation of lands. The bill was therefore framed to accord with their views in this respect, taking only a quantity of land sufficient for the uses of the company.

Conceiving that it lay within the sphere of my legitimate duties, and having spent my time during most of three previous sessions of Congress in endeavoring to procure the passage of a bill making grants of land to the State of California to aid in the construction of railroads therein, I prepared early in the session a bill making a grant of lands to the State of California for this purpose, but not without misgivings on the subject in view of the declared policy of the Republican party at this session, in opposition to making grants of land to any but actual settlers; but on conversation with many members of that party, I found them well disposed—that a favorable feeling towards California existed among them, and that many members would vote for such a bill for California, who would, perhaps, vote differently on a similar bill for another State, upon the grounds that, although in opposition to their policy, it would be unjust to refuse to California the same aid for

her internal improvements which had been freely granted to so many Southern and Western States. Thus encouraged, and looking for assistance to the votes of those States which had been similarly benefited, a bill (marked "I" accompanying) was prepared, introduced and referred to the Committee on Public Lands.

The bill, as originally framed, contemplated a road from the northern to the southern boundary of the State, with two branches, leading easterly to the eastern boundary, and a branch leading westerly to San Francisco, and asking ten sections of land per mile. The bill was referred in Committee to Hon. Mr. Barrett, of Missouri, who agreed to take charge of and report it favorably. Owing to delays in procuring information from the Land Department, and other causes, the bill made no progress in Committee. Mr. Barrett's time was also taken up in attending to his contested election case as to leave very little time to attend to other matters. The bill was therefore transferred to the charge of Hon. John G. Davis, of Indiana, who was friendly to and proposed to report it favorably. At Mr. Davis' request, I computed the quantity of lands and number of miles of road, which, when footed up, appeared so large that it was thought best to reduce both the length and number of sections per mile. Accordingly a new bill was drawn up for a substitute, contemplating a system of valley roads extending from the head of Tulare Valley on the south, to Shasta on the north, to San Francisco and Benicia or Vallejo on the west, and to the eastern boundary of the State on the east. The quantity of land was also reduced to seven sections, or 4,480 acres per mile, or about 3,500,000 acres in all; and it was further provided that where, by reason of the occurrence of Spanish or Mexican grants, or mineral lands, or lands condemned by the United States Surveyor as worthless, the full amount contemplated by the bill could not be had within certain limits, the balance of the quota might be selected from any of the Government lands (not mineral lands) within the limits of the State, such selection to be made by agent or agents to be appointed by the Governor, and selections to be approved by the Secretary of the Interior.

Mr. Davis had also charge of similar bills for the Territories of Kansas and Nebraska, which were first acted upon by the Committee, reported to the House, put on their passage and lost.

Mr. Davis, feeling somewhat chagrined at the fate of the bills, requested to be relieved of the charge of ours, which was again transferred to the charge of Hon. Eli Thayer, of Massachusetts, Chairman of the Committee on Public Lands, who expressed himself in favor of the bill and manifested an interest in our movements. The business had so accumulated on the hands of the Committee that it was sometime before our bill came before them for action. They finally took it up, passed it in Committee unanimously and authorized the Chairman to report it favorably to the House. We urged on Mr. Thayer the necessity of making an early report to the House, to which he assented, but said that it was the intention of the Committee to ask of the House

one or two days to be set apart for the consideration of business of that Committee, when all their business would be disposed of.

The Charleston Convention intervening, no business was transacted for ten days, and Mr. Thayer being a delegate to the Chicago Convention, nothing was done with it until his return, except to prepare a copy of the bill which was introduced in the Senate by Mr. Latham and referred to the Committee on Public Lands. General Lane, on that Committee, consented to look after it there.

On Mr. Thayer's return, the public business of importance had so accumulated in the House that he was unable to procure a time to be set for the consideration of the business of his Committee, and it was doubtful even if it would be called before the close of the session.

There is a generally favorable feeling towards this bill in the House, and could it have been gotten up it would undoubtedly have passed.

Mr. Burch has exerted himself with commendable zeal, and did everything in his power to induce it to be reported to the House.

In case this bill passes, I would state that the lines of railroad, as called for in the bill, are laid down on a map I prepared for the Committee on Public Lands, who required the indorsement or approval of the delegation, who gave such approval. The map, therefore, becomes valuable as indicating the position of the lines to which the aid granted in the bill was contemplated to be given. This map will be preserved for future reference.

I have also devoted a portion of my time and attention to the bill providing for a survey of the eastern boundary of California, which, having passed and received the approval of the President, leaves nothing more to be said about it. A copy of that bill is appended, also a copy of my communication to the delegation with regard to the difficulties and cost of making such survey.

I have also collected some reliable information with regard to the operating of locomotive engines on heavy grades, which becomes highly important in view of solving the question of crossing the Sierra Nevada mountains, as it establishes the fact that grades of as high as three hundred and fifty feet per mile can be overcome and operated with perfect safety.

I think it just and proper to state that, through the kindness and personal exertion of Hon. J. C. Burch, a room was provided in the Capitol (the old Vice President's room), easy of access, upon the same floor with the hall of the House and Senate, which was appropriately furnished and given me for my uses and purposes. This was considered a general headquarters for the Pacific Railroad. I procured all the maps, reports, surveys, and papers of every kind, to be found on the subject, and, it being so convenient to the Halls, many of the Senators and members were accustomed to drop in almost daily. You may be assured that no opportunity was lost to further our views and impress on them the importance in which the subject is held in California

I conceive the occasion a proper one to express my obligations to our Congressional delegation for the uniform kindness they have extended to me and the interest they have manifested throughout. Also to Lieutenant Abbott, of the Engineer Corps, U. S. A., in charge of Pacific Railroad surveys, for his kindness in furnishing me with copies of the maps, profiles, etc., in his charge. Also to Messrs. Curtis, Phelps, Stevens, Stout, Otero, French, Logan, Elihu B. Washburne, Thayer, Lice and Grow, members of the House.

It gives me pleasure to be able to present the accompanying testimonial, signed by the entire delegation from California, also by Messrs. Lane, Curtis, Phelps and E. B. Washburne, approving my course in Washington.

I would also state that, although the expenses of my mission, apart from my time, have cost me over $2,500, the only bills I have to present are:

For printing bill and circular in New York	$20
For printing bill and circular in Washington	20
Total	$40

Accompanying this report will be found the following papers, copies of which are at the service of the Executive Committee: A—Debate in House on Pacific Railroad Bill; B—Bill printed in New York; C—Printed Circular accompanying; D—Bill printed in Washington; E—Circular accompanying; F—Full Official Report of Proceedings of Pacific Railroad Committee at each meeting (valuable); G—Communication of T. D. Judah to Pacific Railroad Committee; H—Letter of Approval of Delegation; I—Circular of Railroad Convention held at Louisville March 21, 1860; J—Memorial of Edward Larned to Congress, on Pacific Railroad; K—Letter of H. D. Whitcomb, Chief Engineer Virginia Central Railroad; L—Letter of Thomas Dodarnead, Superintendent Virginia Central Railroad; M—Letter of M. W. Baldwin & Co., locomotive builders, Philadelphia; N—Pamphlet by Charles Ellett, Esq.; O—Three Speeches of Hon. Wm. M. Gwin on Pacific Railroad; P—Original Bill of Hon. Mr. Curtis; Q—Bill of Select Committee; R—Bill introduced by Hon. Mr. Kennedy, United States Senate; S—Bill of Convention, introduced by Hon. Messrs. Haun and Burch; T—Report of Select Committee; U—Bill introduced by Hon. Messrs. Wigfall and Scott; V—Argument and Bill of F. W. Lander, Esq.; W—Bill introduced by Hon. Mr. Stout; X—Bill introduced by Hon. Mr. Boteler; Y—Communication to delegation respecting Survey of Eastern Boundary; Z—Copy of Map furnished Committee on Public Lands.

All of which is respectfully submitted.

Very respectfully,

THEODORE D. JUDAH.

No 2.

REPORT

OF THE

Theodore D Judah

CHIEF ENGINEER

Oct 1st 1861

ON THE

PRELIMINARY SURVEY

AND

COST OF CONSTRUCTION

OF THE

CENTRAL PACIFIC RAILROAD,

OF

CALIFORNIA,

ACROSS THE

SIERRA NEVADA MOUNTAINS,

FROM

SACRAMENTO TO THE EASTERN BOUNDARY OF CALIFORNIA.

SACRAMENTO, October 1, 1861.

CALIFORNIA STATE LIBRARY
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Central Pacific railroad Chief Engineer

REPORT

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SACRAMENTO, OCTOBER 1, 1861.

OFFICERS

OF

CENTRAL PACIFIC RAILROAD COMPANY,

OF

CALIFORNIA.

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CHARLES CROCKER, Sacramento; D. W. STRONG, Dutch Flat;

CHARLES MARSH, Nevada.

REPORT.

ENGINEER'S OFFICE,
CENTRAL PACIFIC R. R. OF CALIFORNIA.

SACRAMENTO, October 1, 1861.

TO THE PRESIDENT AND DIRECTORS OF THE CENTRAL PACIFIC RAILROAD COMPANY OF CALIFORNIA:

GENTLEMEN—Agreeably to your instructions, I have completed the preliminary survey of a Railroad across the Sierra Nevada Mountains, from the city of Sacramento to a point on the Truckee River, at the eastern base of mountains; the results of which, confirm the facts established by the barometical reconnoissance made last fall.

A preliminary examination was made, and barometrical observations taken last fall upon three routes—one through Eldorado county *via* Georgetown, another *via* the present route (Illinoistown and Dutch Flat), and the third *via* Nevada and Henness Pass.

These observations demonstrated the existence of a route from Sacramento across the Sierra Nevadas, by which the summit could be attained with grades of 105 feet per mile; accordingly, field parties were organized early in the spring, and a thorough Railroad Survey made, the results of which are embodied in the following Report, developing a line with lighter grades, less distance, and encountering fewer obstacles than found upon any other route or line hitherto examined across the Sierra Nevada Mountains; and proving, by actual survey, that the difficulties and formidable features of this range can be successfully overcome for Railroad purposes.

Among the objectionable features which render the Sierra Nevada Mountains formidable for Railroad operations, are found—

FIRST. THE GREAT ELEVATION TO BE OVERCOME IN CROSSING ITS SUMMIT, AND THE WANT OF UNIFORMITY IN ITS WESTERN SLOPES.

It will be observed that in crossing a summit of 7000 feet in height, an average grade of 100 feet per mile, can only be attained, with a distance or base of 70 miles. Should any irregularity of surface occur in this distance, the grade would be correspondingly lessened or increased, in conformity with such irregularity of surface.

When it is considered that the average length of the western slope of Sierra Nevada Mountains, from summit to base, is only about 70 miles, and the general height of its lowest passes about 7,000 feet, the difficulty of locating a Railroad line with 100-feet grades is correspondingly increased, as it becomes absolutely necessary to find ground upon which to preserve a general uniformity of grade.

In the present instance, the distance from base to summit, by Railroad line, is 81 miles ; the elevation of summit 7,000 feet above Sacramento, and the maximum grade 105 feet per mile ; showing a remarkable regularity of surface, without which the ascent could not have been accomplished with our maximum grades.

Secondly. From the impracticability of river crossings in the mountains.

To those unacquainted with the mountain topography of the western slope of the Sierra Nevadas, and accustomed to the lesser elevations and gentler slopes of the Atlantic States, it would be difficult to convey an adequate idea of the extensive proportions of the irregularities of surface which attach to these mountains.

The general course of the Sierras is north-westerly, and parallel to the line of Pacific coast.

This western slope being at right angles, extends therefore in a south-westerly direction, which is the general course or direction of the rivers and streams upon its western slopes.

Between a point opposite the city of Sacramento (about latitude 38½) and Shasta (about 41 degrees), this western slope is intersected by numerous rivers, having their sources near the summit of the Sierras. They are as follows : The South Fork of American, Middle Fork and North Fork, Bear River, Deer Creek, South Fork of Yuba, Middle Fork, North Fork, the South, Middle and North Forks of Feather River.

These rivers run through gorges or canons, in many places from 1,000 to 2,000 feet in depth, with side slopes varying from perpendicular to an angle of forty-five degrees.

The ridges formed by these rivers are sharp, well defined, and in many places so narrow on top, as to leave barely room for a wagon road to be made without excavating the surface of ridge.

The branches, also, of many of these rivers have worn out gorges as deep as those of the rivers, and present physical barriers to a line of communication either crossing them, or extending in a northerly and southerly direction.

These rivers are generally made the dividing lines between

mountain counties, which are of oblong shape, long and narrow; the counties of Eldorado, Placer, and Nevada, extending from base to summit of Sierra. The thoroughfares of travel extend into these counties along these ridges; the focus of travel for the large counties of Eldorado, Placer, Nevada, and Sierra, being Sacramento (a portion of this travel, however, concentrating at Marysville).

No wagon road exists across the Middle Fork of the American. The inhabitants of Eldorado county, in order to reach the divide between Middle and North Fork of the American, by wagon, are obliged to proceed down to within eight or ten miles of the Sacramento valley, in order to obtain a crossing.

The towns of Forest Hill, Yankee Jim's, Todd's Valley, Michigan Bluffs, Bird's Flat, Sarahsville, &c., lying in the divide between the North and Middle Forks of the American, are reached by crossing the North Fork, about four miles above Auburn, at which point the road is excavated on the face of a steep side-hill above the river canon, which is about 1,000 feet high, closely following its bends and sinuosities; the hill upon each side being about four miles in length, or a total of eight miles in length; the grade for wagon-road varying from 250 to 300 feet per mile.

Iowa Hill and Wisconsin Hill, although upon this same divide, are separated from the above-mentioned towns by two or three canons or branches of the North Fork, running nearly parallel.

One of these canons is deeper and more precipitous than the crossing of North Fork, above Auburn; the descent into the canon being about one thousand five hundred perpendicular feet. A wagon-road, wide enough for a single team, with occasional turning-out places, has been built across, but a distance of ten miles of road is rendered necessary in order to reach across a direct line of about three miles, the grades being between three hundred and four hundred feet per mile.

From Iowa Hill to Illinoistown and Nevada, the canons of Bear River, of Steep Hollow, Greenhorn, Wolf Creek, and Deer Creek, intervene.

Above Nevada, the South, Middle, and Main Yuba also intervene.

The present traveled stage road from Nevada to Eureka, &c., crosses South Yuba about eight miles from Nevada, the road descending in about two miles one thousand feet, and in the next five miles ascending two thousand feet, to the top of ridge.

Thus it will be seen, that in order to reach the summit of Sierra Nevada, a Railroad line must avoid the crossings of any of the canons; for were it even practicable to follow down into them with a

grade of one hundred feet per mile, it would still be necessary to retrace the line upon the opposite side, which would involve (in a canon of, say, one thousand feet in depth) the additional length and cost of twenty miles of line of maximum grade, with the crossings of side ravines and tributaries.

The *present line* pursues its course along an *unbroken ridge, from base to summit, of Sierras*, the only river crossing in the mountains being Little Bear River (a tributary of Main Bear River, about three miles above Dutch Flat), which is crossed at an elevation of fifty feet, and will require only about fifty feet span of bridge.

THIRDLY. IN ITS ENTIRELY AVOIDING THE SECOND SUMMIT OF THE SIERRA NEVADA MOUNTAINS.

A cross section of the main range of Sierra Nevada presents a profile showing two summits, with a range of elevated table-land lying between; thus, upon the profile of Lieutenant BECKWITH'S survey across the Sierra Nevada, *via* Madelin Pass, are shown two distinct summits, thirty-five miles apart, with a range of elevated table-land between them.

The present Placerville wagon-road to Washoe also crosses these two summits; passing the first range *via* Johnson's Pass, it descends into Bigler Lake Valley, and ascending again, crosses the second summit via Daggett's pass, into Carson Valley.

Lake Bigler lies in this valley between the two summits—is about 35 miles long, and from 12 to 15 miles in width; is entirely surrounded by mountains and lofty peaks, excepting at one point on its western shore, where the Truckee River forms its outlet.

Running at first north-westerly about eight miles, then northerly about ten, thence north-easterly about twelve miles, the Truckee passes down between these two summits with a nearly uniform fall of about thirty-five feet per mile; thence sweeping round to the eastward, it passes through the second range or summit, at a depression where it seems to be entirely worn away down to the level of the river, thence pursuing its way through an extensive plain known as the Truckee Meadows; thence through the Washoe Mountains to the Big Bend; thence northerly about twenty miles, finds its way into Pyramid Lake.

At the Donner Lake Pass, where our line crosses the first summit of Sierra Nevada, the altitude of line is about 1,200 feet above the Truckee River. Donner Lake lies immediately beneath, at a depth of 1,000 feet.

Two long side ranges or spurs inclose the lake and its valley,

declining in height gradually to the Truckee River, about eight miles below.

Our line is carried down along the side-hill of the spur or range immediately above the lake, and upon its south side to the Truckee River, which point it reaches in a distance of eleven and a half miles of line, with an uniformly descending grade of 105 feet per mile from the summit.

The Truckee thus reached, all further difficulty of location ceases, as it pierces its way through all obstructions with an uniform descent, not exceeding forty feet per mile, to the Humboldt Desert, which forms the sink of the Humboldt and Carson Rivers.

Thus, the second summit of Sierra Nevada and the crossing of the Washoe Mountains are entirely avoided; and from the western base to the summit of Sierra Nevada, the grade is uniformly ascending or level, there being no descending grade going eastward; while from the summit to Big Bend of Truckee or Humboldt Desert, a uniform grade is likewise maintained.

THE PROMINENT FEATURES OF THIS LINE MAY BE BRIEFLY ENUMERATED AS FOLLOWS:

1st. It crosses the Sierra Nevada Mountains, and reaches the Truckee River, in 123, and State line 140 miles from Sacramento.

2d. Big Bend of Truckee, or Humboldt Desert, is reached in 178 miles.

3d. It crosses the State at nearly its narrowest width.

4th. It pursues nearly a direct course from Sacramento to Big Bend of Truckee.

5th. It forms a local road for the counties of Sacramento, Placer, and Nevada.

6th. It commands, and will perform, the entire business of Nevada Territory, Washoe, and the Silver mineral region.

7th. It will also command the business of newly-discovered Humboldt mineral district, Pyramid Lake, Esmeralda, and Mono mineral districts.

8th. It crosses the Truckee Meadows at the head of Steamboat Valley, which, with Washoe Valley and Eagle Valley, connects with Carson Valley, enabling a branch road, with light grades, to be built to any point on Carson River.

9th. It reaches the summit (or an altitude of 7,000 feet above Sacramento), in 81 miles from base of mountain.

10th. It reaches eastern base of Sierra Nevada in 11½ miles from Summit.

11th. It follows the valley of Truckee River, without obstacle, to Big Bend or Humboldt Desert.

12th. It entirely avoids the second summit of Sierra Nevada.

13th. Its maximum grades is 105 feet per mile, or less than those of the Baltimore and Ohio Railroads.

14th. The grades down the Truckee will not exceed 40 feet per mile.

15th. The elevation of line is maintained, continuously, to the summit—there being no down grade running easterly to Summit.

16th. An uniformly descending grade is maintained from the summit easterly to the Truckee, or eastern base.

17th. Encounters no elevated plateau of table-land at Summit.

18th. Running to and from summit with maximum grades, cannot have an extensive snow-line.

19th. Runs through extensive forests of Pitch and Sugar Pine, Fir, Cedar, and Tamarack, which latter two species of timber are abundant, and will furnish excellent cross-ties.

20th. Crosses no deep river canons or gorges.

21st. Its longest tunnel will not exceed 1,350 feet in length, and no shafting will be required.

22d. Shortest radius of curvature, 573 feet.

23d. Navigable waters of the Sacramento River at all seasons of the year its western terminus; Washoe and the great Basin its eastern terminus.

24th. At Big Bend of Truckee, the line is in position to proceed *via* the Humboldt to Salt Lake, or follow the Simpson route to some point.

25th. *Saving in distance* over route *via* Madelin Pass and headwaters of Sacramento, as surveyed by Lieut. Beckwith, from Lassers Meadows or Humboldt crossing, 184 miles.

26th. Saving in cost of Pacific Railroad line, taking Lieut. Beckwith's estimate from Lasseur's Meadows or Humboldt crossing, as compared with cost of present proposed line, in thirteen and one half millions of dollars.

27th. Reduces the time of passenger transit to and from Washoe to 8½ hours. Passengers leaving Virginia station at 5 A. M., will reach San Francisco the same evening.

28th. Saving in cost of transportation of freight to citizens of Washoe or Nevada Territory, one million of dollars per year.

29th. Affords a market for low-class silver ores (now thrown aside), for shipment to Europe, from over 3,000 mining claims.

30th. Is advantageously located for an extension to Oregon.

31st. Completes first western link of Pacific Railroad, overcoming its greatest difficulties.

GENERAL REMARKS CONCERNING LOCATION, AND DESCRIPTION OF RIDGE OR DIVIDE.

This divide is the strip of land lying between the American River and its north fork (on the south), and Bear River and the South Yuba (on the north).

The American River unites with the Sacramento River at the city of Sacramento ; Bear River unites with Feather River (a tributary of the Sacramento) about 30 miles north of the city of Sacramento.

The direction of divide is north-easterly and south-westerly. Its width opposite Sacramento is about 30 miles.

The foot-hills of Sierra Nevada begin at Folsom, on the American, and at Johnson's Ranch, on Bear River ; the line of foot-hills running through or near Lincoln (about 15 miles, northerly, from Folsom, and 10 miles, southerly, from Johnson's Ranch), forming a piece of land in Sacramento Valley, between the foot-hills and Sacramento River, of about 30 miles in length and 20 in width. The ravine of Bear River, from Johnson's Ranch to English Bridge (a distance of about 15 miles), pursues nearly an easterly course, while the course of the ravine of American River, from Folsom, is nearly north, to a point within about 8 miles (south-easterly), from English Bridge. Here the American River branches, and the ravine of its north fork, as well as that of Bear River, pursue a north-easterly course, but gradually approach each other to a point about 4 miles above Illinoistown, called Long Ravine, where the two rivers are less than three miles apart.

At this point occurs the greatest depression on the ridge, and the greatest difficulties in location were found.

From Long Ravine, the ravines of these rivers diverge somewhat, but are scarcely further than six miles apart at any point—the ravine of North Fork and its tributaries and branches continuing up to the summit.

Numerous branches and ravines extend northerly from the North Fork, rendering a location on that side extremely difficult, if indeed practicable, our line at Long Ravine being about 1,200 feet above the bed of North Fork. The ravine of Bear River extends up about fourteen miles above Dutch Flat, widening out near the source of Bear River into a beautiful valley, called Bear Valley, about two miles long and one mile wide. Diminished in size to a small creek, Bear River passes through this valley, and a mile above, is lost among the benches to the right. The ridge between Bear Valley and North Fork of American is about 800 feet high.

Here occurs a singular freak of nature. The South Yuba, augmented by numerous large branches along its course, is seen emerging from impassable rocky canons, and sweeping down through the head of Bear Valley, it turns suddenly to the north, and pierces the ridge or divide lying north of Bear Valley, forcing its way out to the northward, between rocky walls, surmounted by peaks from 2,000 to 3,000 feet high.

There is little doubt that, at some former period, the waters of South Yuba flowed through Bear Valley, and down the ravine of Bear River; and, indeed, it would be no difficult matter, to turn the whole volume of South Yuba into Bear River at the present time.

The South Yuba Canal Company, who supply the Nevada divide with water for mining purposes, take their water from the South Yuba, at the head of Bear Valley, bringing it down through Bear Valley by the side of Bear River, with a grade of about ten feet per mile, being, at points, as near as 200 feet to Bear River, and not over fifteen or twenty feet above it. Thus, it will be seen, that the canon of Bear River becomes, and is the same as that of the South Yuba, which latter river now takes its place, the divide or ridge being now bounded by North Fork of American on the south, and South Yuba on the north.

The ravine or valley of South Yuba continues on to the summit of Sierra Nevada, and in Summit Valley, within two miles of Summit, the river is a larger stream than is Bear River in Bear Valley.

A barometrical examination of this route indicated that the top of ridge or divide could be reached at Clipper Gap, near the head of Dry Creek, 48½ miles from Sacramento. From this point to Resevoir Gap (about 1½ miles above Dutch Flat, and 25 miles from Clipper Gap), it was found that the line must be carried on the top of ridge.

The line of top or crest of ridge being far from uniform, of course the lowest points or gaps in ridge become commanding points, and it was found necessary to carry the line from gap to gap, passing around the intervening hills, upon their side slopes.

It was also found, upon reaching New England Gap (near the New England Mills, about six miles from Clipper Gap), that to Long Ravine, a distance of eight miles, the ridge was nearly level, the elevation of grade at Long Ravine being only about 100 feet higher than at New England Gap.

Also, that the ridge rose rapidly from Long Ravine, eastward to the next gap (called Secret Ravine Gap).

It was also found that from Resevoir Gap (1½ miles above Dutch Flat) the ridge rose too rapidly for one maximum grade, and that for the next 20 miles, to the bottom or valley of Yuba, the line must be carried on the main slope of Bear and Yuba Rivers. It was thought, however, that the line could be carried up Canon Creek (a tributary of North Fork, with tolerably smooth side slopes), to Dutchman's Gap, about eight miles above, and there cutting through the gaps, brought out on to Bear River side-hill.

Subsequent examination proved this to be impracticable. Canon Creek rising too rapidly for our grades, we were therefore compelled to carry the line immediately on to Bear River side-hill, and were fortunate enough to be able to avail ourselves of the side-hill of Little Bear River for that purpose.

Being on the top of ridge at Resevoir Gap, we were enabled to cross Little Bear River near its head, and to use its side-hill for an approach to Main Bear River.

The barometrical elevations also indicated that the Yuba could be reached about twenty miles above Dutch Flat, at the head of its canons, and the line carried along up its smooth, uniform bottoms for some distance ; then, by taking to its south side-hill, Summit Valley and Summit reached with maximum grades.

The South Yuba, from this point (twenty miles above Dutch Flat), called Yuba Bottom, extends to the summit, a distance of sixteen miles, most of the way through a valley, in some places 500 or 600 feet wide. The old Truckee emigrant trail follows down through the valley a portion of this distance, generally over a smooth natural road.

Were the fall of this river evenly distributed, it would afford a uniform grade of a little less than 100 feet per mile to the summit.

Rising, however, from Yuba Bottom (say half a mile at a grade of fifty feet per mile), the river canons for half a mile at a steeper grade ; thence for four miles its grade is about sixty feet per mile ; it then canons, rising about 250 feet in a mile, at a point called Slippery Rock Canon.

The river then rises gently for about three miles, and again rapidly for three miles, to Summit Valley.

Through Summit Valley (a distance of two and a half miles) its grade is scarcely twenty-five feet per mile, then rises rapidly again to the summit.

Inasmuch as the indications of altitude of the aneroid barome-

ter proved lower than those of the true level, after continuing our line for six miles along Yuba Bottom, we were obliged to retrace our steps and commence again near Yuba Bottom, running up on south side-hill of Yuba, with maximum grade, into Summit Valley, in order to attain a sufficient elevation to reach the summit.

Summit Valley is a beautiful valley, near the source of the Yuba, about two and a half miles long and three-quarters of a mile wide, yielding excellent pasturage for cattle, hundreds of which are driven there each summer.

From the summit, looking easterly, you appear standing upon a nearly perpendicular rocky wall, of 1,000 feet in height.

Immediately below is seen a valley, from one to two miles wide, extending up from the Truckee River to nearly beneath your feet. Donner Lake (about three and a half miles long, by one mile in width) occupies the upper portion of this valley, and its outlet is seen pursuing its course down to a junction with the Truckee. Two long ranges or spurs are seen, on either side, parallel with and inclosing the lake, reaching from the summit to Truckee River. Immediately beyond the river is seen the second summit of Sierra Nevada, while still further in the distance the Washoe Mountains are plainly visible.

Passing the summit, our line is carried down upon the side-hill of the range, on south side of Donner Lake, descending with the maximum grade for about eleven miles.

The distance, in a direct line, from Summit to Truckee River, does not exceed eight miles ; but we fortunately encountered two long ravines, with smooth side slopes, which, with the sinuosities of side-hill, gave about three additional miles of distance, enabling us to reach the Truckee with maximum descending grades.

PARTICULAR DESCRIPTION OF LINE.

Commencing at the city of Sacramento, the line will cross the American River about half a mile above Lisle's Bridge ; thence pursuing a north-easterly course, for twenty-five miles, across the Sacramento Valley, it reaches the town of Lincoln, or intersection with the California Central Railroad, which point is at an elevation of 140 feet above the top of the levee at Sacramento.

From Lincoln the line follows up an indentation or bay, in the foot hills, with grades not exceeding 50 feet per mile (passing half a mile north of Virginia), to Barmore's, thirty-one miles from Sacramento (elevation, 340 feet above Sacramento), from which point grades of 84 feet per mile are first used.

Continuing on up the southerly bank of Doty's Ravine (passing about one mile north of Gold Hill), the line crosses Doty's Ravine, running down the north side of same for about one-quarter of a mile, with ascending grades ; thence, turning to the right, it crosses the traveled road, near Dutch Colonel's House, and passes up the upper portion of what is known as Shipley Ravine.

Thence crossing north-easterly corner of the old Boyen Ranch, it follows northerly (near the line of what is known as Sailor's Ravine Ditch), at the base of the foot hills, to Sailor's Ravine.

Running up Sailor's Ravine, about one-third of a mile, the line crosses the same, and, turning to the left, it passes about 300 feet east of Moore's House ; continuing on, up a branch of Sailor's Ravine, to a point called Bar Summit, having attained an elevation of 660 feet above Sacramento.

Thence, winding about between the heads of small ravines, it crosses near the head of Taylor's and Sedergest Ravines, and passing about two-thirds of a mile north of Taylor's House, reaches the side-hill of Dry Creek.

Passing up the south side-hill of Dry Creek, the line follows up two tributary ravines a short distance, to a favorable crossing, and in a short distance further strikes another tributary, called Deadman's Ravine.

This Ravine presenting a smooth side-hill, the line continues up the same about half a mile, to a favorable point, where it crosses, at a hight of about 45 feet.

Pursuing its course down the east side-hill of Deadman's Ravine, it strikes again the main side-hill of Dry Creek, following the same to the point where it breaks from its smooth, uniform valley, into rocky canons ; thence up Dry Creek about two and a half miles, to the Auburn and Nevada Stage Road.

From the Nevada Stage Road to Clipper Gap (a distance of six miles), the line follows up the valley of Dry Creek, with grades varying from 50 feet to 105 feet per mile. (At one point on the profile, a grade of 116 feet per mile will be observed. This is the grade upon the line, as run ; but a slight alteration of line will reduce it to 105 feet.

From point where Dry Creek canons to Clipper Gap, the line passes up and near to Oert's house, Page's Redwines, passing under the flume of Bear River Ditch, and crossing Wyman's Turnpike and Auburn and Nevada Stage Road at Hawes' Store.

Thence, passing over lands and near dwellings of Welles, Gilbert, Cook, Kingsley, Cogswell, Watson, Buckley, and Neil, it

reaches Gasorway's, or Golden Gate Hotel (passing about 25 feet in front of Gasorway's house).

Here the stage-road forks, one branch following up a side ravine to the left, over Tunnell Hill, and *via* Empire Mills to Illinoistown, while our line continues to the right, up Dry Creek, about a mile further, passing about 200 feet in front of Predmore's house.

Here, instead of following Dry Creek further (it rising too rapidly for our grades), we cross a gap to the right (called Clipper Gap), and run up the north side hill of Clipper Ravine (a tributary of North Fork of American), to Wild Cat Summit, crossing several short steep side ravines.

Passing through Wild Cat Summit (about one-quarter mile south of Widow Hawes' house), we pass round Hawes' Hill, and curving to the left, cross the main road, and pass up a smooth ravine to the top of the ridge, at a point called Applegate Summit.

A short distance further on, the line passes through Evergreen Gap, crossing the divide again at Baney's Gap, from which point it curves round on side hill (on North Fork side) to Star House Gap, near the Star House.

Here the line crosses Star House Gap (and the traveled road) about 50 feet high, passing up very nearly on the top of divide, to the head of Applegate Ravine, which runs into Bear River, this point being called New England Gap.

From New England Gap the line passes out upon north side hill of North Fork.

Crossing the traveled or Stage Road, it runs along above the same, and about 500 feet above New England Mills, through peach orchard of Murphy ; through Manzinata and Chaparral Gaps, and over Sugar Loaf Summit to Lower Illinoistown Gap, at the point where upper stage road crosses the gap (about one and a quarter miles below Illinoistown).

Crossing this gap, about 30 feet high, the line continues on about half a mile further, over a broken country, to a point called Bear River Gap, where it turns abruptly to the left, with maximum curve, and crosses the ridge with a tunnel of 500 feet in length, emerging on the south side hill of Bear River, along which it pursues its course to Storm's Gap and Long Ravine Gap, leaving Illinoistown about one mile to the right.

Here was found the greatest difficulty in location ; Long Ravine Gap being an unusually low depression, the ridge beyond rising quite rapidly to attain its average elevation.

Here the line crosses gap, about 70 feet high, and curving to

the right follows the side hill of Rice's Ravine (leading to North Fork) for about one mile, encountering a succession of short, steep, abrupt side ravines, to Cape Horn, which is a bold, rocky bluff, nearly perpendicular, and 1,200 feet high, above the North Fork of American.

Passing round the face of this bluff, about 200 feet below the table above, we strike the side hill of Robber's Ravine, which runs parallel to Rice's Ravine, and continues up along the side hill of same for about 1½ miles, crossing Oak Summit, and passing about three-quarters south of Madden's Toll House, through Trail Summit.

From this point the line follows along the face of side hill above North Fork, striking Secret Ravine, along which it runs for about one mile, when, turning to the left, it passes up a tributary side ravine to its head, the line striking a point about two hundred feet south of stage road, one mile south of Secret-town.

Running thence, along side of road nearly a mile, it crosses the same, and passing between Everhart's house and barn, at Secret-town, it reaches the head of Secret Ravine, or Secret-town Gap, crossing it with trestling, about 50 feet in height.

Turning to the left, the line now passes north of Cold Spring Mountain (on Bear River side), and for two miles encounters a succession of steep side ravines, where some of the heaviest work on the line will be found. Two tunnels will be necessary on this piece of line, each about 600 feet in length.

Leaving the side hill again, the line strikes a long and nearly level bench, about two miles in length, extending up nearly to Dutch Flat.

This bench is the well-known gravel ridge which extends along the slopes of the Sierras at about this elevation, and on which are situated the mines worked by the hydraulic mining process.

Extending up this ridge to within about one mile of Dutch Flat, the line again takes to side hill to left, running near to Strong's Cabin, Brickell's Steam Saw Mill, Dutch Flat Steam Saw Mill, to the Dutch Flat Water Company's large reservoir (about 1½ miles above Dutch Flat.)

The town of Dutch Flat lies on Bear River side hill, about half way down to Bear River, the line passing about half a mile in the rear, and about 300 feet higher than the town.

At this last-named reservoir, which is upon the top of ridge (called Reservoir Gap), we leave the crest of ridge for the last time,

it rising too rapidly to be available for a Railroad line at our maximum grades.

Turning to the left, the line now runs at nearly a level grade, about 1½ miles further to Little Bear River, which stream it crosses just above the Saw Mill, near Widow Homer's Ranch.

Pursuing its course down the north side-hill of Little Bear River, it departs at Elmore Hill, passing round the same, and enters upon the side hill of Bear River.

The river gorge at this point is about 1,500 feet deep—our line being about 500 feet below the top of ridge, and from 1,000 to 1,200 feet above the river. Its side hill is steep, rocky, and marked by many abrupt indentations and corresponding salient points.

The line was carried *round* most of these points ; but upon a final location, it will probably be found advisable to run through the sharp points with short tunnels—the longest of which will be 1,350 feet—none of them, however, requiring shafting.

The line passes up this side hill of Bear River (the grade line being nearly parallel with the crest or top of ridge, and from 500 to 700 feet below the same), crossing through Zerr's Ranch (about 600 feet north of his buildings), striking the lower end of Bear Valley, about 200 feet high, on its south side-hill.

Continuing on for two miles, it leaves the head of Bear Valley, at an elevation of about 350 feet on side hill above the same, crossing the head of Bear River (which is here but a small creek), following it up to its source, which is in a marshy lake, about 1½ mile above Bear Valley.

It will be observed on the profile, that from Zerr's Ranch to head of Bear River a grade line is indicated, running about 100 feet higher on the side hill.

In locating the line as run, the intention was to cross Bear River, and continue on the side hill of the main gorge to Yuba River (near head of South Yuba Water Company's Canal), keeping up on main side hill of South Yuba to Yuba Bottom ; but upon examination, this proved to be impracticable, the Yuba above Bear Valley running in deep rocky canons, with perpendicular rocky walls of granite, too rugged in their character to admit of the location of a line over them.

It therefore became necessary to carry the line on to a bench above and south of the Yuba River, and nearly at the base of main ridge—a line from Zerr's Ranch to this point being practicable at our maximum grade, the only change necessary being to make the location a little higher on side hill.

Our present line passes about 100 feet to left of Jew David's Cabin. On the location as changed, it will pass a short distance in the rear of same.

Continuing on, the line pursues the general course of Yuba River, about six miles further, to the point where old Truckee emigrant trail leaves Yuba Bottom to ascend on the main ridge to the south (which point is 19 miles above Dutch Flat by trail, and about 22½ miles by our line), called Yuba Bottom.

This point is at the head of the lower canons and falls, between Yuba Bottom and Bear Valley.

In subsequent location, it will be necessary to run the line between these two points, (viz., head of Bear River to Yuba Bottom) a little lower down on side hill, as indicated on profile, for the following reasons: Fearing that the elevation of Yuba Bottom might prove too high, the line was run from head of Bear River, at our maximum grade, in order to gain as much elevation as possible. But on reaching Yuba Bottom, it was found that this gave more elevation than was necessary; therefore the last half mile of line was run down onto Yuba Bottom. The last elevations show, that a grade of 80 feet per mile can be obtained from head of Bear River to Yuba Bottom.

From this point (Yuba Bottom), the line follows the river for about one mile, passing through a short canon, and emerging at very near the level of water surface in river (called Hall's Canon).

From this point the line was first run for about six miles up the river valley, taking to side hill at the two upper canons, the line being carried up to the upper ford, at head of Wilson's Cut-off; but finding that the Summit could not be reached without increasing grade on the remaining distance, our parties proceeded to Summit, from which a line was run down on south side hill of Yuba, at maximum grade, striking into the valley line, at head of first small canon (about one mile above Yuba Bottom), called Hall's Canon.

The location, therefore, is carried from Hall's Canon, on south side-hill of Yuba, at maximum grades, into lower end of Summit Valley (about 3½ miles below summit of Sierras), crossing the old Truckee Emigrant Trail, near Kidd's Reservoir, about half-way up to the top of ridge, the line striking the lower end of Summit Valley, about the level of Yuba River; running thence straight across Summit Valley, about two miles, at a grade of about 25 feet per mile, to a point on the south side of Summit Valley, near Cook's old cabin, the line takes to side hill on the right, and in 1½ mile further reaches the summit of Sierras, with a cutting of about fifty feet.

By commencing the last-named ascent a little further back in Summit Valley, the summit can be reached with maximum grades without any excavation. The elevation of surface at summit is 7,027 feet above top of levee at Sacramento.

DESCENT ON EASTERN SIDE OF SIERRA NEVADA.

Pursuing its course from the summit easterly, the line commences its descent with maximum grade, and, passing to the right, is carried for next two miles over a steep, rocky side hill, on which will be found quite heavy rock cutting; thence, turning abruptly to the right, it enters upon side-hill of Strong's Ravine, and, running up the same, about one mile, crosses over, and is carried down over a smooth side-hill, to a point 600 feet higher than the south-west corner of Donner Lake, thence pursuing its course along the side-hill for about three miles, it encounters Coldstream Ravine, and runs up the same a little over a mile.

Crossing Coldstream, the line follows along down its south side-hill to within about $\frac{1}{4}$ mile of the Main Truckee, where, turning to left, it crosses the valley of Donner Creek, accomplishing the descent in about $11\frac{1}{2}$ miles of downward maximum grade. Thence the line was carried about five miles down the valley of Truckee River, and the survey terminated at a point 128 miles from Sacramento.

The object of this survey being to accomplish the crossing of the Sierras with a Railroad line, it was considered unnecessary, at this time, to extend the survey any further down the Truckee River; barometrical elevations were taken from our line up the Truckee River to Lake Bigler, and also down the same to the lower end of Truckee Meadows, showing its average fall to be only about 35 feet per mile.

I also carried a series of observations down Steamboat Valley to Steamboat Springs, thence across the Washoe Mountains (*via* Virginia, Flowery, and Six Mile Canon) to the Carson River, thence down the same to Fort Churchill—a profile of which is shown on the small, general profile of grades.

A continuation of our line down the Truckee to Big Bend follows the same, from terminus of survey, 13 miles, to Neil's Ranch, or Henness Road; thence 7 miles to Stout's crossing of Truckee; thence through the Truckee Meadows and across head of Steamboat Valley 8 miles to Stone's crossing or western base of Washoe Mountains; thence 23 miles, through Washoe Mountains, to Big Bend of Truckee, or edge of Humboldt Desert, making total distance about 178 miles.

No obstacle exists, and a line, with light grades over exceedingly smooth surface, can be carried from Stout's crossing of Truckee, up Steamboat Valley, to its head ; thence through Washoe Valley into Eagle Valley, which opens into Carson Valley ; thence down the Carson River to Fort Churchill, or edge of desert, making, however, a longer line than that down Truckee.

GRADES.

The following table of grades extends from Lincoln (25 miles from Sacramento, and 6 miles from westerly base) to terminus of survey (or four miles beyond eastern base of mountains), or includes 11 miles beyond base of mountains. The average grade from Sacramento to Lincoln (25 miles) being six feet per mile.

TABLE OF GRADES.

LENGHTH OF PLANE, FEET.	GRADE ASCENDS PER MILE.	GRADE DESCENDS PER MILE.	LENGTH OF PLANE, FEET.	GRADE ASCENDS PER MILE.	GRADE DESCENDS PER MILE.	LENGTH OF PLANE, FEET.	GRADE ASCENDS PER MILE.	GRADE DESCENDS PER MILE.
3,000	9	.....	4,000	53	.....	500	Level.	
3,000	53	.....	6,750	105	.....	5,000	79	
1,000	Level.	.....	18,250	Level.	.....	3,000	105	
3,000	45	.....	3,000	105	.....	3,000	79	
4,500	Level.	.....	1,000	Level.	.....	38,000	105	
6,500	45	.....	6,000	36	.....	2,000	Level.	
4,000	36	.....	13,500	Level.	.....	1,000	53	
4,300	53	.....	17,500	105	.....	25,000	79	
6,300	79	.....	1,000	Level.	.....	2,750	26	
3,200	Level.	.....	3,500	105	.....	3,500	105	
500	53	.....	1,000	Level.	.....	2,000	Level.	
12,700	84	.....	3,500	105	.....	57,500	105	
3,300	Level.	.....	1,000	53	.....	1,750	53	
5,000	84	.....	2,500	105	.....	2,500	Level.	
6,000	65	.....	2,000	Level.	.....	13,750	105	Summit.
7,100	84	.....	13,000	105	.....	45,000	.....	105
1,300	53	.....	1,000	Level.	.....	1,750	.....	Level.
2,500	105	.....	1,000	53	.....	15,250	.....	105
1,800	26	.....	4,000	Level.	.....	2,500	.....	Level.
4,000	75	.....	172,500	105	.....	6,500	.....	53
1,000	53	.....	1,250	Level.	.....	3,200	.....	39
1,000	75	.....	1,000	79	.....	2,750	.....	Level.
1,700	105	.....	1,000	Level.	.....	3,500	.....	39
2,500	75	.....	4,000	53	.....	1,000	.....	53
2,000	105	.....	14,000	105	.....	2,000	.....	39
2,000	65	.....	3,000	53	.....	.....	.....	
3,000	105	.....	4,000	79	.....	.....	.....	
15,000	116	.....	10,500	105	.....	.....	.....	
11,000	105	.....	1,000	53	.....	.....	.....	

SUMMARY OF GRADES.

GRADE. FEET PER MILE.	MILES, ASCENDING.	MILES, DESCENDING.	
9	0.56		
26	0.86		
36	1.89		
39		1.04	
45	1.80		
53	5.08	1.42	
65	1.53		
75	1.38		
79	8.39		
84	8.03		
105	43.08	11.41	
116	2.84		
Level.	11.19	1.33	
Total distance Lincoln to Summit.....	87.63	15.20	
Deduct 7 miles beyond base	7.00	4.00	Deduct beyond base
Leaves distance west'n base to Summit.....	80.63	11.20	Summit to eastern base.

From which it appears that upon the western slope:

Total distance from western base to Summit is.....80.63 miles.
No. of miles of Ascending Grade 116 ft. per mile } 2.84
No. of miles of Ascending Grade 105 ft. per mile } 43.08
No. of miles of Ascending Grade 84 ft. per mile..... 8.03
No. of miles of Ascending Grade 79.75 ft. per mile ... 9.77
No. of miles of Ascending Grade 65 ft. per mile..... 1.53
No. of miles of Ascending Grade 53 ft. per mile..... 5.08
No. of miles of Level 11.19

While upon the eastern side, or descent, there are 11.41 miles of grade, of 105 ft. per mile.

The total elevation of grade overcome at Summit is 7,000 feet.

That the elevation overcome in crossing the Summit of Sierra Nevada is greater than that upon any other line of road in the United States, is true. But it is no less true that the grades employed in reaching that summit, are less than the maximum grade employed on important roads in the United States; the Pennsylvania Central having 10 miles of grade of 95 feet per mile, while the Baltimore and Ohio Railroad has one plane, 15 miles in length, on which are $11\frac{1}{2}$ continuous miles of grade of 116 feet per mile, and $3\frac{1}{2}$ of 100 feet per mile. A portion of the Virginia Central Railroad was operated successfully a period of five years over 2 miles of

grades of 300 feet feet per mile, with curves of 300, and one as small as 238 feet radius—with a 30-ton locomotive engine.

By referring to the above table of grades, it will be seen that the longest piece of continuously-ascending maximum grade of 105 feet per mile, is about 10 miles ; all of these heavy grades being relieved at frequent intervals by lesser grades or levels. So that on no portion of the road will there be so long a piece of continuously-ascending grade of 105 feet per mile, as upon the 116-feet grades of the Baltimore and Ohio Railroad.

It is deemed unnecessary, here, to enter upon a calculation of the effective power of locomotive engines upon different gradients, General McClellan having given very full notes of the results of his investigations upon the subject, in his memoranda on P. R. R., published in the Report of the Secretary of War upon P. R. R. Surveys. The following extracts from his Report are given here :

"On the Pennsylvania Central Road, are gradients of 95 feet per mile, for 9¾ miles. Passenger trains ascend this grade with a velocity of 24 miles per hour, and descend at 20 per hour.

"The working load of the heavy freight engines (weighing 65,000 lbs., on eight drivers), on the 95 feet gradient, is 125 tons net, or about 208 tons, including tender and cars."

Of the Baltimore and Ohio Railroad, he says :

"The most interesting and analogous case, however, to which I can refer, is that of the Baltimore and Ohio Railroad, one of the great lines in the United States, alluded to in a previous part of this article, as connecting the seaboard with the valley of the Mississippi across the Alleghany Mountains. In the year 1850, 447,000 tons of merchandise and 180,000 passengers were transported on this Road, the receipts amounting to $1,343,000, the Road being only about half completed. When finished to the Ohio River, the receipts are expected to amount to $3,000,000. On this Road are heavy gradients, with several curves of 600 feet radius, and some of four hundred feet. It is to the mountain district of the Road just opened, that I wish particularly to invite attention, and for this purpose an extract is made from the official Report of the Chief Engineer, Mr. Latrobe, one of the most distinguished engineers of North America, in which he describes the route and grades over the Alleghany Mountains."

"At about a mile below this point, the *high grade of* 116 *feet per mile begins and continues about* 11½ *miles*, crossing the Potomac from Virginia into Maryland near the beginning of the grade, and thence ascending the steep side slopes of Savage River and Crab Tree Creek, to the summit, at the head of the latter, a total distance of about 15 miles. Upon the last three and a half miles of which, the grade is reduced to about 100 feet per mile. From the summit, the line passes for about 19 miles through the level and beautiful tract of country, so well known as the Glades, and near their western border the route crosses the Maryland boundary, at a point about sixty miles from Cumberland, and passes into the State of Virginia, in whose territory it continues thence to the terminus on the Ohio. From the Glades, the line *descends by a grade of* 116 *feet per mile, for eight and a half miles*, and over very rugged ground, and thence three and a half miles further to Cheat River, which it crosses at the mouth of Salt Lick Creek. The route, immediately after crossing this river, ascends along the broken slopes of the Laurel Hill, by a *grade of* 105 *feet per mile for five miles*, to the next summit, passing the dividing ridge by a tunnel of 4,100 feet in length ; and whence, after three miles of light grade, a descent by the *grade of* 105 *feet per mile for five miles* is made to the Valley of Raccoon Creek, by which and the Valley of the Three Forks Creek, the Tygarts Valley River is reached in fourteen miles more, at the Turnpike Bridge above described, and 103½ miles from Cumberland."

VIRGINIA CENTRAL RAILROAD.

Upon the Virginia Central Railroad, the Alleghany Mountains were crossed with grades of 296 feet per mile, and the Road operated successfully a period of over five years.

Reference is had to a pamphlet published by CHAS. ELLET, Esq., the Engineer of the Road, who says :

EASTERN SIDE.

"The length of descent, from summit to foot of grade. on eastern side, is 2 37-100 miles.

"The road descends in this distance 610 feet.

"The average grade is, therefore, 257 feet per mile.

"The maximum grade is 296 feet per mile.

WESTERN SIDE.

"Length of descent 2 2-100 miles.

"Road descent in this distance 450 feet.

"Average grade is 223 feet per mile.

"Maximum grade is 280 feet per mile.

"On both sides of mountains, the ruling curves are described with a radius of 300 feet, on which the grade is 237 feet per mile."

"The admirable engines relied on to perform the extraordinary duties imposed upon them in the passage of this summit have failed *but once* in this period—2½ years—to make their regular trips. The mountain has been covered with deep snow for many weeks in succession, and the cuts have been filled, for long periods, many feet in depth, with drifted snow ; the ground has been covered with sleet and ice, and every impediment due to bad weather and inclement seasons has been encountered, and successfully surmounted in working the tracks.

"The total weight of engines is 55,000 lbs., or 27½ tons, when the boiler and tank are supplied with fuel and water enough for a trip of eight miles."

"Ascending engines stop daily on a grade of 280 feet per mile, and are there held by the brakes, while the tanks are being filled, and are started again, at the signal, without difficulty."

With the practical experience afforded by the workings of these Roads, it may be safely assumed, that a thirty-ton engine, with eight drivers, will ascend the maximum grades of this Road with an ordinary passenger train at a speed of twenty miles per hour.

That an engine of the same class will ascend these grades, with a freight train weighing 150 tons, at a speed of 13 miles per hour.

The following is taken from memoranda of Gen. McCLELLAN on subject of Pacific Railroad :

Calculations for a 30-ton Engine on 6 drivers, total adhesive weight..	67,200 pounds.
By formula 1, maximum load on a level is.....	1,680 tons.
By formula 2, maximum grade up which this Engine can draw a load of 76 tons is.....	401 feet.
By formula 4, the maximum grade for same load is.....	281 feet.
By formula 1, the maximum load for grade of 150 feet is	186 tons.
By formula 3, the maximum load for same grade is	133½ tons.
By formula 1, the maximum load for grade of 200 feet is	146 tons.
By formula 3, the maximum load for same grade is	104½ tons.

COMPARISON OF ELEVATIONS OVERCOME.

ROUTE.	LENGTH. Miles.	SUMMIT ELEVATION. Feet.	TOTAL RISE AND FALL. Feet.	MAX. GRADE. Feet.
Boston route.....	500	1,440	4,700	83
N. Y. Central.....	400	650	2,100	30
N. Y. and Erie.....	460	1,720	6,500	70

Route.	Length. Miles.	Summit Elevation. Feet.	Total Rise and Fall. Feet.	Max. Grade, Feet.
Philadelphia route	340	2,400	5,600	95
Baltimore route	390	2,700	7,000	116
Charleston route	490	1,400	5,000	40
Savannah route	440	1,400	5,000	40
Santiago	110	2,640	4,340	119
Central Pacific	140	7,000	8,800	105

It will thus be seen, that the sum of ascents and descents upon this line are but 1,800 feet more than upon the Baltimore and Ohio Railroad, our line crossing a summit of 7,000 feet, the elevation of summit on that Road being only 2,700 feet.

The small percentage of total rise and fall upon this line, as compared with the altitude of summit, is due to the fact, that there are no undulatory grades—the rise and fall is constant, no elevation being lost.

GRADES ON LIEUT. BECKWITH'S ROUTE FROM LASSENS TO SALT LAKE—451 MILES.

The following in a statement of grades from Lassens to Salt Lake, taken from Lieut. Beckwith's Profile, assuming his projected improvements in location :

	Miles.	Ascending Grade, Feet per Mile.	Descending Grade, Feet per Mile.
Lassen's to Junction Main Forks of Humboldt	145	4	
Junction Forks to Creek	35	31	
To stream near Summit	8	89	
To summit Humboldt Mountains	1	25	
Summit to mountain stream	3		25
To Camp 16	8		58
To Camp 15	15	4	
To Camp 14	28	7	
To Camp 13	10		21
To Camp 12	20	Level.	
To Camp 10, Fish Creek	28		21
To Point on Fish Creek	16	Level.	
To Camp 8, Granite Mountains	40		10
To Camp 6	24	$0\frac{1}{2}$	
To Camp 5	15		12
To shore of Salt Lake	21		10
To Camp 3	13	18	
To Oquirrh Mountains, or opposite Salt Lake City	21	8	
	451		

The highest grade shown being 8 miles of 89 feet grade, which can probably be reduced to 50 or 60 feet per mile.

ALIGNMENT.

The first 25 miles of line from Sacramento to Lincoln will be generally straight. From Lincoln to Barmore's, or six miles further, the least radius of curvature will be 1,432 feet.

From Barmore's (or western base) to the Truckee River, or eastern base of Sierra Nevada, the line is mostly on side hill; there is, consequently, a preponderance of curved line rendered necessary by the sinuosities of side hill and projecting points.

The least radius of curvature, however, upon the line is 573 feet, or a ten-degree curve.

The Baltimore and Ohio Railroad has several curves of 600 and some of 400 feet radius. (See Report of General McClellan.)

The Virginia Central Railroad had curves of 300 feet radius, on which the grade was 237 feet per mile. One curve upon that Road had a radius of 238 feet. (See Report of Chas. Ellett, Esq.)

Curves of 500 feet radius are common upon many of our Eastern Roads, and are safely traversed at a speed of 30 miles per hour.

For a particular description of the alignment of this Road, attention is invited to the large map of location (scale 400 feet per inch) exhibiting each curve and tangent, with the length and radius marked upon it.

Also, to the tabular arrangement of the same, in which each curve and tangent is laid down, from which it will be seen that between Barmore's and Truckee River, a distance of 92 miles, there is of straight line:

No. of Curves of 573 feet radius.....157
No. of Curves of 716 feet radius..... 65
No. of Curves of 955 feet radius.....140
No. of Curves of 1,432 feet radius..... 65
No. of Curves of 1,910 feet radius..... 62
No. of Curves of 2,865 feet radius..... 23

From the eastern base of mountains to Big Bend of Truckee, the length of curved line will not exceed thirty per cent. of the whole distance, the curves being generally of over 1,500 feet radius.

Thus, it will be seen that the alignment of this Road compares favorably with that of many of the most important Roads of the Atlantic States.

SNOWS.

The argument of obstruction from snow having been frequently urged against the Central route for Pacific Railroad, I have taken much pains to arrive at correct conclusions upon this subject, and feel warranted in the statement, *that a Railroad Line, upon this route,*

can be kept open during the entire year for the transaction of its business.

It is true that snow falls to a greater depth upon the elevated portions of this line than upon the lines of Railroads in the Atlantic States.

The depth at which snow lies upon this route is plainly distinguishable at any season.

The trees are generally covered with moss down to the level of the snow, and thousands of them can be seen entirely free from moss up to a certain height, and almost entirely covered with moss from that height.

Frequent marks have also been made by persons who have traversed the route on snow-shoes during the winter, by axe marks chopped in the tree at the level of the snow.

The limbs of the small trees also afford indications of the height of snow ; those limbs lying beneath the snow maintaining their original or natural position, while those above the snow-line are almost universally bent downwards, and not unfrequently broken by the weight of snow.

These observations lead to the conclusion that the greatest depth of undisturbed snow is 13 feet at the summit.

In places where drifts occur, the depth is of course greater, and at corresponding points less than the average level.

This may, at first, seem to be a serious obstacle to the passage of Railroad Trains. But this depth of 13 feet is not the result of a single storm, but the *accumulation of a number of successive storms, occurring during the winter.*

Snow does not melt very rapidly at this elevation, during the winter.

A storm will occur, and snow fall to the depth, perhaps, of three or four feet.

Another storm will, perhaps, add two or three, or four feet to this depth.

Successive storms add to its depth ; but it is believed that its highest level is not over 13 feet.

The town of Dutch Flat, 72 miles from Sacramento, and 40 miles from Summit, may be considered the foot of snow line on western side—snow seldom falling more than two feet there, and melting off in a day or two.

The average depth of snow at lower end of Donner Lake is about six feet.

At Neil's Ranch, on the Truckee River, 28 miles easterly from

the Summit, I am assured by Mr. Neil, that the greatest depth of snow last winter was 18 inches, and that during the five years he has lived there, it has not exceeded three feet in depth.

It may be safely concluded that the line of deep snows terminates where our line strikes the Truckee River, or, say, 12 miles from the summit, making 52 miles of snow line.

It will also be remembered that our line is almost exclusively a *side-hill line*, from which the snow can be more easily removed than from a level surface.

It is only necessary, then, to start an engine with snow-plows, from the summit each way, at the commencement of a storm, clearing the snow as it falls. A similar course of procedure at each successive storm, will keep the track open during the entire winter.

It is also stated that a crust soon forms upon the snow, which prevents its drifting badly.

The only point where we shall encounter a level surface of snow, is in Summit Valley, for about two miles.

By elevating the track at this point, no trouble need be anticipated.

The great dread, and real danger of a storm in the mountains, does not arise from the depth of snow, but from the entire absence of shelter and relief in the mountains, there being no houses or accommodations, excepting upon the wagon roads across to Washoe.

The Placerville wagon road is kept open for travel during the entire winter, hotels being established every few miles along the route. With a Railroad built upon this route, this objection would also be entirely obviated.

TUNNELS.

Upon the line, as located, but four tunnels appear upon the profile, but upon further examination, it has been deemed expedient to cut through several sharp projecting points, instead of carrying the line around them.

It is estimated that the cost of these tunnels will not exceed the cost of the increased length of line around these points.

It will be observed that the tunnels are comparatively short, the longest being 1370 feet in length ; they can all be worked from either end, reducing the greatest consecutive length of tunneling to 685 feet.

They are in rock, generally granite, and require no shafting.

The cost of shafting in long tunnels is usually one-third the whole cost of tunnel.

Their lengths are as follows :

1	500	feet	long.	1	1,300	feet	long.	1	1,200	feet	long.
1	600	"	"	1	1,370	"	"	1	1,100	"	"
1	800	"	"	1	1,250	"	"	1	400	"	"
1	1,200	"	"	1	1,300	"	"	1	1,070	"	"
1	1,000	"	"	1	1,370	"	"	1	1,100	"	"
1	1,100	"	"	1	300	"	"	1	450	"	"
								18	17,410		

Making 18 tunnels, with an aggregate length of 17,410 feet, costing, at $50 per linear foot, $870,500.

The longest tunnel can be excavated in 13 months, at the rate of 2 feet per day.

The following statistics were given in Report of Gen. McClellan to the Secretary of War, on Pacific Railroad :

Nerthe Tunnel, France—15,153 feet long ; 24 shafts ; aggregate length of which was 7,589 feet ; deepest of which was 610 feet ; in very hard limestone ; dimensions, 29½ by 26¼ feet.

Its cost was as follows :

For mining body of tunnel	$705,982
For mining shafts	109,081
Masonry for shafts	49,069
Lining for body of tunnel	423,711
Cost of aqueduct	10,607
Total cost of tunnel	$1,298,450

Cost of mining main body of tunnel, $46.58 per linear foot.

Woodhead Tunnel, England—3½ miles long 5 shafts ; 400 to 600 feet deep ; rock, granite, or mill-stone rock ; entire cost, $1,026,705 ; cost of tunnel, *including shafting*, $55 per linear foot. Excavated at the rate of eight feet per day.

Uppingham Tunnel—1,320 feet long ; cost $40 per linear foot.

Black Rock Tunnel, Pennsylvania—1,932 feet long ; rock, greywacke ; six shafts ; cost $77 per linear foot.

The cost per cubic yard of excavating tunnels in the United States, has been :

Lehigh, very hard granite	$4 36	per linear foot.
Schuylkill State	2 00	" "
Union State	2 09	" "
Blue Ridge Tunnel	4 00	" "

A section of tunnel, averaging 20×17 feet, contains 12⅔ cubic yards per linear foot.

TIME CONSUMED IN MAKING THE TRIP WITH PASSENGER TRAINS FROM SACRAMENTO TO VIRGINIA STATION.

	Distance.	Speed per Hour.	Time.
Sacramento to Barmore's	31 miles.	31 miles.	1 hour.
Stoppage at Barmore's	.....	.....	:30
Barmore's to Summit	81 miles.	20 miles.	4
Carried forward	112		5:30

	Distance.	Speed per Hour.	Time.
Brought forward.....	112		5:30
4 stoppages, 15 minutes each.....		.....	1
Summit to Truckee River.....	11 miles.	15 miles.	:45
Stoppage.....		.....	:15
Tuckee to Neil's.....	17 miles.	34 miles.	:30
Neil's to Stone's or Virginia Station,	15 miles.	34 miles.	:30
	155 miles.		
Total time consumed in making trip..... or $8\frac{1}{2}$ hours.			8:30

A train leaving Sacramento at 6 A. M., would arrive at Virginia Station (13 miles North of Virginia) at 2.30 P. M., passengers reaching Virginia City at 4.30 P. M.; Gold Hill, 4.50 P.M.; Silver City, 5.15; Chinatown, 6.10, and Carson City, 7.15 P. M.

Freight trains leaving Sacramento at 6 A. M., would reach Virginia Station at 7 P. M., including all stoppages.

Returning, the passengers leaving Virginia Depot at 5 P. M., would arrive in Sacramento in time to take the 2 o'clock boat, and arrive in San Francisco the same evening.

ESTIMATE OF COST.

The estimated cost of this Road will be found to exceed the average cost of Railroads in the Atlantic States, but is nevertheless a cheaper line than has been heretofore estimated for the crossing of the Sierra Nevada Mountains.

The rugged nature of the country over which the line passes, the character of the excavations (which for 90 miles are almost exclusively rock cuttings), the high cost of labor in California, the extra weight of rail (estimated at 75 lbs. per yard), with its cost of transportation to California, all tend to swell the cost of Road beyond the average cost of Railroads in the Atlantic States.

But when it is considered that this line accomplishes the crossing of Sierra Nevadas (by far the most difficult and expensive portion of the great line across our continent), is carried over an elevation of 1000 feet in height, entirely avoids the second summit of Sierra Nevada, saves 184 miles in distance, and $13,500,000 in cost to the Pacific Railroad, its cost of $88,000 per mile can scarcely be deemed high.

The Boston and Providence Railroad cost.....	$81,273 00	per mile.
The Boston and Lowell Railroad cost	78,636 00	"
The New York and Erie Railroad, about	80,000 00	"
The Hudson River Railroad, about....	80,000 00	"

COST OF ROAD FROM SACRAMENTO TO STATE LINE, OR NEIL S—140 MILES.

	MILES.	COST PER MILE.	TOTALS.
Sacramento to Lincoln	25	$50,000	$1,250,000
Lincoln to Barmore's	6	60,000	360,000
Barmore's to Nevada Road	12	90,000	1,080,000
Nevada Road to Clipper Gap	6	50,000	300,000
Clipper Gap to Long Ravine	12	80,000	960,000
Long Ravine to Gravel Ridge	9	110,000	990,000
Gravel Ridge to Bear River	5	85,000	425,000
Bear River to South Yuba	21	100,000	2,100,000
Yuba to Hall's Canon	1	75,000	75,000
Hall's Canon to Summit Valley	11	100,000	1,100,000
In Summit Valley	2	75,000	150,000
To Summit Sierras	2	150,000	300,000
Summit to Strong's Canon	2	150,000	300,000
Strong's Canon to Truckee	10	100,000	1,000,000
Truckee to Neil's or State Line	16	70,000	1,120,000
Add 18 Tunnels			870,000
Total cost to State Line	140 miles		$12,380,000

Or an average cost of $88,428 per mile.

ADDITIONAL COST TO STONE'S CROSSING OF TRUCKEE OR VIRGINIA STATION—15 MILES.

	MILES.	COST PER MILE.	TOTAL.
Neil's to Stout's	7	$70,000	$490,000
Stout's to Stone's	8	50,000	400,000
Total cost	15		$890,000
Making total cost of 155 miles			$13,270,000

ADDITIONAL COST TO BIG BEND OF TRUCKEE OR HUMBOLDT DESERT—23 MILES.

	MILES.	COST PER MILE.	TOTAL.
Stone's Crossing or Big Bend	23	$70,000	$1,610,000
Making total cost of 178 miles			$14,880,000

Or an average cost of $83,600 per mile.

ADDITIONAL COST OF A RAILROAD LINE FROM BIG BEND OF TRUCKEE TO LASSEN'S MEADOWS, OR TO A CONNECTION WITH LIEUT. BECKWITH'S LINE ON HUMBOLDT RIVER—104 MILES.

	MILES.	COST PER MILE.	
From Big Bend of Truckee to Lassen's Madows	104	60,000	$6,240,000
Making total cost to L. Meadows, 282 miles,			$21,120,000

Or an average cost of $74,900 per mile.

ADDITIONAL COST OF LINE FROM LASSEN'S MEADOWS TO SALT LAKE, TAKEN FROM ESTIMATES OF LIEUT. BECKWITH, P. R. R. REPORTS—451 MILES.

	MILES.	COST PER MILE.	
Lassen's Meadows to Salt Lake....	451	$45,000	$20,295,000
Making total cost of line from Sacramento to Salt Lake, 733 miles,			41,415,000
Or an average cost of $56,500 per mile.			

ESTIMATED COST OF LINE FROM SALT LAKE TO COUNCIL BLUFFS, BY LIEUT. BECKWITH, P. R. R. REPORTS—1,125 MILES.

	MILES.	
Council Bluffs to Salt Lake.....	1,125	$58,485,000
Making total cost from Council Bluffs to Sacramento.....	1,858	99,870,000
For purpose of comparison, add cost Sac to Benicia.....	58	2,630,000

	MILES.	
Gives total length, Council Bluffs to Benicia	1,916	Total cost, $102,500,000
Estimate by Beckwith's route.....	2,100	Total cost, $116,000,000
Saving, in distance.....	184	In cost, $13,500,000

RECAPITULATION AND ESTIMATE OF ENTIRE COST OF PACIFIC RAILROAD LINE, TAKING LIEUT. BECKWITH ESTIMATES, FROM COUNCIL BLUFFS TO LASSEN'S MEADOWS, AND THENCE VIA THIS ROUTE TO SACRAMENTO.

Total distance, 1,858 miles.

	MILES.	COST PER MILE.	TOTALS.
Council Bluffs to Black Hills.....520		$35,000	$18,200,000
Black Hills to South Pass.....291		75,000	21,825,000
South Pass to Fort Bridger.....131		50,000	6,550,000
Fort Bridger to Salt Lake 173		60,000	10,380,000
Timpanogos Canon.....	10	150,000	1,500,000
Salt Lake to Lassen's Meadows 451		45,000	20,295,000
Lassen's to Big Bend, Truckee.....104		60,000	6,240,000
Big Bend to California State line....	38	66,000	2,500,000
State line to Sacramento 140		88,428	12,380,000
Total length	1,858	Total cost....	$99,870,000

The importance of this route to the great enterprise of which it is destined to form a link, cannot be more clearly manifested than in the reduction of cost in constructing the Pacific Railroad.

In all the previous comparisons of cost and distance, the Central Route has labored under great disadvantage, and has not taken the rank among routes, to which, by its merits, it was entitled.

A reduction in cost of $13,500,000, and a saving in distance of 184 miles of line, present features which may well invite consideration from the friends of that project.

GENERAL REMARKS.

It will be observed that the estimates of cost and distances from Big Bend of Truckee to Salt Lake are made upon the Beckwith or Humboldt Route, a distance of 733 miles.

While it is possible that a more southerly line can be found along or near the Simpson route, in the absence of surveys, or data for estimate, no reliable opinion can be formed of its feasibility or probable cost.

Our line, at Big Bend of Truckee, is in position to join an extension on either route.

According to the itinerary of Captain Simpson, it does not appear that the more southerly route presents any advantage in distance to Salt Lake City.

The distance given by Captain Simpson from Carson City to Camp Floyd, is 554 miles. Adding to this the distance from Sacramento to Carson City, 142 miles, and the distance from Camp Floyd to Salt Lake City—say 35 miles—it gives the total distance from Sacramento to Salt Lake City as 731 miles.

From our line at Big Bend of Truckee, *via* Simpson route to Salt Lake, the distance would be about the same as to Salt Lake City, on the Humboldt route, but should the main line of lower Road be carried around the head of Utah Lake, and up the Timpanogos, it would make the lower line about 50 miles the shortest.

If a line can be found from the sink of Humboldt across to Gravelly Ford (on that river), it will shorten the Humboldt route about fifty miles.

There are three important considerations, however, which give the route up the Humboldt River a manifest advantage over any other route for a Railroad line.

First. Its availability for a connection with Oregon and Washington.

Lassen's Meadows are only about eighty miles south of the forty-second parallel of latitude, which parallel is the southern boundary of Oregon, there being a good emigrant road from that point to Jacksonville and Fort Lane in Oregon, the line following around the northerly end of Mud Lake, up Black Rock Creek, southerly end of Goose Lake, and between the Klamath Lakes to Jacksonville, from which point a good railroad line, with light grades, was found (see Report of Lieuts. Williamson and Abbott) to Portland on the Columbia River, the distance from Lassen's Meadows to Jacksonville being about 280 miles.

Second. The recent discoveries of silver on the Humboldt River in the vicinity of Lassen's Meadows.

The well-known discoveries of silver ore in the Washoe Mountains has drawn thither, in the last two years, a population of about 17,000 souls, most of whom are hardy, able-bodied miners. Numerous flourishing towns and villages have sprung into existence, permanent improvements have been made, and but a few years will elapse before a new State will be formed out of that portion of Nevada Territory.

Within the last few months, discoveries of silver have been made on the Humboldt, which are said to rival those of Washoe. Already a new city is in existence, and hundreds of miners have gone there. There will, of course, be but a small emigration there this winter; but next spring and summer will undoubtedly witness an influx of population hardly second to that of Washoe.

The mines are stated to be of great extent and richness, many of the out-croppings assaying over $1,000 per ton. A number of tons of ore have been sent to Sacramento and San Francisco for trial, the results of which have proved them to be of extraordinary richness.

Cinnabar and coal have also been discovered in this locality.

Several mills are in the course of erection, and permanent improvements are being rapidly made.

Being on the main emigrant route to California, and accessible from both Oregon and California, the accessions to its population cannot fail to be large; and it will not be many years before the new State of *Humboldt* will apply for admission into the Union.

Thirdly. From the feasibility of this as a Railroad route, and the character of soil, &c., along its route.

After striking the Humboldt at Lassen's, there are 190 miles of unobstructed valley, on which the grade for 145 miles is only four feet per mile; 36 miles are level; 24 miles has a grade of ½ a foot per mile; 160 miles has a grade 4 feet; 50 miles has a grade of 7 and 8 feet; 53 miles of grade of 8 and 10 feet; 43 miles a grade of 18 to 21 feet; 40 miles of from 25 to 31 feet; 18 miles of grade of 58 feet; there being only 8 miles of a higher grade, in 89 feet, which can undoubtedly be reduced.

The elevation at Lassen's is only about 250 feet lower than the Big Bend of Truckee, the distance 104 miles.

There will be then 539 miles of light grades, not exceeding 31 feet per mile, on a line 555 miles long—a feature of no little importance in determining the location of the Pacific Railroad.

The valley of the Humboldt has been traversed by many thousands of emigrants to Oregon and California, and is well known to embrace many valleys of alluvial, fertile soil.

The general character of the soil in the great basin is barren and sterile, except where intersected by rivers. The valley of the Humboldt has received the largest share of the emigrant travel, for the reason that it afforded good grass, and water in abundance.

Being more inviting to emigrants, it will settle up more rapidly, and thereby greatly facilitate the construction of a Railroad line on this route.

Accompanying this Report, will be found the following Maps, Profiles, &c.:

A. Large map, on a scale of 400 feet per inch (90 feet long), showing the curves and tangents, from Dutch Flat to Truckee River, for filing in Secretary of State's Office.

B. 17 sheets of location, numbered 1 to 17, inclusive, scale 400 feet per inch, showing curves and tangents, from Barmore's (or western base), to Dutch Flat, for filing, as above. (Also, copies of same.)

C. 5 large maps (20 feet long), scale 400 feet per inch, showing curves and tangents, as follows :

No. 1. Barmore's to Clipper Gap.
No. 2. Clipper Gap to Dutch Flat.
No. 3. Dutch Flat to Rattlesnake Bluffs.
No. 4. Rattlesnake Bluffs to Summit.
No. 5. Summit to eastern terminus of survey.

D. 32 sheets, numbered 1 to 32, scale 400 feet per inch, exhibiting the angular line as run with projected curves and tangents thereon.

E. Map (16 feet long) scale 5,000 feet per inch, exhibiting the country from San Francisco to terminus of survey, showing our line, with adjoining towns and rivers, for 10 miles on either side, and connecting railroads.

F. Traced copy of the same.

G. Smaller map, prepared for lithographing, showing whole country, from San Francisco to Big Bend of Truckee.

H. Britton and Rey's map of California.

I. U. S. Surveyor General's map of State.

J. Elliott's map of a portion of the State.

K. Ransom's map of San Francisco and 40 miles round.

L. Map of Sac Valley R. R., Lac to Folsom, scale 5000.

M. Map of California Central R. R., location Folsom to Marysville.

N. Map of California Northern R. R., Marysville to Oreville.

O. Map of survey, Sacramento to Benicia.

P. Map of survey, Marysville to Benicia.

Q. Map of survey, Folsom to Placerville.

R. Smith's map of survey for Canal up North Fork of American River to Lake Bigler.

S. Connected map of Lieut. Beckwith's surveys, showing the topography, &c., from Benicia to Salt Lake.

T. Map of Capt. Simpson's route to Camp Floyd.

U. Large map, compiled in office of Secretary of War, showing country west of the Mississippi River, with all the surveys for Pacific Railroad laid down thereon.

V. Smaller map of routes, as above.

W. Map of Rancho del Paso, through which our line passes.

X. Map of City of Sacramento.

Y. Map of survey across Sacramento Valley.

Z. Degroot's map of Warshoe Mines, also Pierce's map of Washoe.

PROFILES.

a. Sheets, 1 to 34 inclusive, working profile of line as run (horizontal scale, 400 feet ; vertical scale, 30 feet per inch).

b. Profile of line to Dutch Flat (horizontal scale, 500 feet per inch ; vertical scale, 50 feet per inch).

c. Two Profiles of line reaching from Lincoln to Truckee River (horizontal scale, 1,000 feet ; vertical scale, 100 feet per inch).

d. 1 *Profile*, extending from Sacramento to Big Bend of Truckee ; also showing a section of Washoe Mountains, on a line from Stout's to Fort Churchill (horizontal scale, 11,000 feet; vertical scale, 600 feet per inch).

e. Copy of same, for filing in Secretary of State's office.

f. Profile of Leut. Beckwith's line, Salt Lake to Fort Reading, containing profile of Noble's Pass.

g. 2 sheets of profiles of various Southern passes across Sierra Nevada (published in Secretary of War's office).

h. Barometric profile of reconnoissances in Sierra Nevada Mountains, viz.: Georgetown route ; Dutch Flat route ; Henness Pass route via Nevada.

Also, a set of Pacific Railroad Reports, and all the maps, profiles, &c., relating thereto—published by United States Government.

Our levels indicate that many of the passes in the Sierra Nevada Mountains will be found, upon actual survey, much higher than they have been represented.

The estimates of business, and revenue of Road, will be deferred to another time, in consequence of delay in procuring the statistics of the Washoe trade and business.

In conclusion, I take this opportunity of expressing my obligations to Messrs. Edward Judah, Assistant in charge of Party ; John R. Brown, in charge of Levels ; H. T. Hall, Topographer ; for the able and satisfactory manner in which they performed the arduous duties assigned them ; also to Wm. S. Watson. Esq., Chief Engineer of California Northern Railroad, for valuable assistance in office ; to Dr. D. W. Strong, of Dutch Flat, who accompanied me in my reconnoissance last fall, who was with me during the entire survey, and whose experience in and knowledge of the mountains was of the greatest assistance, and contributed to the success of the survey; also, to S. B. Wyman, Esq., of Virginia ; Mr. Neil, of Neilsburgh; Mr. Applegate, of Empire Mills; Messrs. Egbert and Brickell, of Illinoistown—who were with me on portions of the route ; to Chas. Marsh, Esq., of Nevada, who accompanied me on the reconnoissance *via* Nevada and Henness Pass ; also to Messrs. John Shaw, of Mormon Island; and D. W. McKinney, of Georgetown—who accompanied me on Georgetown reconnoissance ; also, to Mr. Stout, of Stout's Crossing, Nevada Territory; F. Moore, Esq., of Dutch Flat; and R. P. Robinson, Esq., of Sacramento, for courtesies extended.

Very respectfully,

THEODORE D. JUDAH,

Chief Engineer Central Pacific Railroad of California.

No 3.

REPORT

OF THE

CHIEF ENGINEER

Includes 2 pieces of corr. dated Oct 1 1862

ON THE

PRELIMINARY SURVEY, COST OF CONSTRUCTION, AND ESTIMATED REVENUE,

OF THE

Central Pacific Railroad

OF CALIFORNIA,

ACROSS THE

SIERRA NEVADA MOUNTAINS,

FROM

SACRAMENTO TO THE EASTERN BOUNDARY OF CALIFORNIA.

OCTOBER 22, 1862.

SACRAMENTO:
H. S. CROCKER & CO.'S PRINT, 107 J STREET.
1862.

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OFFICERS

OF THE

CENTRAL PACIFIC RAILROAD

COMPANY OF CALIFORNIA.

President,

LELAND STANFORD, Sacramento.

Vice President,

C. P. HUNTINGTON, Sacramento.

Treasurer,

MARK HOPKINS, Sacramento.

Chief Engineer,

THEO. D. JUDAH, Sacramento.

DIRECTORS.

LELAND STANFORD.....of Sacramento.
CHARLES CROCKER.....of Sacramento.
JAMES BAILEY.....of Sacramento.
THEODORE D. JUDAH.....of Sacramento.
L. A. BOOTH.....of Sacramento.
C. P. HUNTINGTON.....of Sacramento.
MARK HOPKINS.....of Sacramento.
D. W. STRONG.....of Dutch Flat.
CHARLES MARSH.....of Nevada.

REPORT.

ENGINEER'S OFFICE,
CENTRAL PACIFIC R. R. OF CALIFORNIA.

SACRAMENTO, October 1, 1861.

TO THE PRESIDENT AND DIRECTORS OF THE CENTRAL PACIFIC RAILROAD COMPANY OF CALIFORNIA:

GENTLEMEN—Agreeably to your instructions, I have completed the preliminary survey of a Railroad across the Sierra Nevada Mountains, from the city of Sacramento to a point on the Truckee River, at the eastern base of the mountains; the results of which confirm the facts established by the barometrical reconnoisance made last fall.

A preliminary examination was made, and barometrical observations taken last fall upon three routes—one through El Dorado county *via* Georgetown, another *via* the present route (Illinoistown and Dutch Flat), and the third *via* Nevada and Henness Pass.

These observations demonstrated the existence of a route from Sacramento across the Sierra Nevadas, by which the summit could be attained with grades of 105 feet per mile; accordingly field parties were organized early in the spring, and a thorough Railroad Survey made, the results of which are embodied in the following Report, developing a line with lighter grades, less distance, and encountering fewer obstacles than found upon any other route or

line hitherto examined across the Sierra Nevada Mountains; and proving, by actual survey that the difficulties and formidable features of this range can be successfully overcome for Railroad purposes.

Among the objectionable features which render the Sierra Nevada Mountains formidable for Railroad operations, are found—

First. The great elevation to be overcome in crossing its summit, and the want of uniformity in its western slopes.

It will be observed that in crossing a summit of 7,000 feet in hight, an average grade of 100 feet per mile, can only be attained, with a distance or base of 70 miles. Should any irregularity of surface occur in this distance, the grade would be correspondingly lessened or increased, in conformity with such irregularity of surface.

When it is considered that the average length of the western slope of the Sierra Nevada Mountains, from summit to base, is only about 70 miles, and the general hight of its lowest passes about 7,000 feet, the difficulty of locating a Railroad line with 100-feet grades is correspondingly increased, as it becomes absolutely necessary to find ground upon which to preserve a general uniformity of grade.

In the present instance, the elevation of summit 7,000 feet above Sacramento, is reached by a maximum grade of 105 feet per mile; showing a remarkable regularity of surface, without which the ascent could not have been accomplished with this grade.

Secondly. From the impracticability of river crossings in the mountains.

To those unacquainted with the mountain topography of the western slope of the Sierra Nevadas, and accustomed to the lesser elevations and gentler slopes of the Atlantic States, it would be difficult to convey an adequate idea of the extensive proportions of the irregularities of surface which attach to these mountains.

The general course of the Sierras is north-westerly, and parallel to the line of the Pacific coast.

This western slope being at right angles, extends, therefore, in a southwesterly direction, which is the general course or direction of the rivers and streams upon its western slopes.

Between a point opposite the city of Sacramento (about latitude

38½) and Shasta (about 41 degrees), this western slope is intersected by numerous rivers, having their sources near the summit of the Sierras. They are as follows: The South Fork of American, Middle Fork and North Fork, Bear River, Deer Creek, South Fork of Yuba, Middle Fork, North Fork, the South, Middle and North Forks of Feather River.

These rivers run through gorges or canons, in many places from 1,000 to 2,000 feet in depth, with side slopes varying from perpendicular to an angle of forty-five degrees.

The ridges formed by these rivers are sharp, well defined, and in many places so narrow on top, as to leave barely room for a wagon road to be made without excavating surface of ridge.

The branches, also, of many of these rivers have worn out gorges as deep as those of the rivers, and present physical barriers to a line of communication either crossing them, or extending in a northerly and southerly direction.

These rivers are generally made the dividing lines between mountain counties, which are of oblong shape, long and narrow; the counties of El Dorado, Placer and Nevada, extending from base to summit of Sierra. The thoroughfares of travel extend into these counties along these ridges; the focus of travel for the large counties of El Dorada, Placer, Nevada and Sierra, being Sacramento (a portion of this travel, however, concentrating at Marysville).

No wagon road exists across the Middle Fork of the American. The inhabitants of El Dorado county, in order to reach the divide between Middle and North Fork of the American, by wagon, are obliged to proceed down to within eight or ten miles of the Sacramento valley, in order to obtain a crossing.

The towns of Forest Hill, Yankee Jim's, Todd's Valley, Michigan Bluffs, Bird's Flat, Sarahsville, etc., lying in the divide between the North and Middle Forks of the American, are reached by crossing the North Fork, about four miles above Auburn, at which point the road is excavated on the face of a steep side-hill above the river canon, which is about 1,000 feet high, closely following its bends and sinuosities; the hill upon each side being about four miles in length, or a total of eight miles in length; the grade for wagon road varying from 250 to 300 feet per mile.

Iowa Hill and Wisconsin Hill, although upon this same divide,

are separated from the above mentioned towns by two or three canons, or branches of the North Fork, running nearly parallel.

One of these canons is deeper and more precipitous than the crossing of North Fork, above Auburn; the descent into the canon being about one thousand five hundred perpendicular feet. A wagon road wide enough for a single team, with occasional turning-out places, has been built across, but a distance of ten miles of road is rendered necessary in order to reach across a direct line of about three miles, the grades being between three hundred and four hundred feet per mile.

From Iowa Hill to Illinoistown and Nevada, the canons of Bear River, of Steep Hollow, Greenhorn, Wolf Creek, and Deer Creek intervene.

Above Nevada, the South, Middle, and Main Yuba also intervene.

The present traveled stage road from Nevada to Eureka, etc., crosses South Yuba about eight miles from Nevada, the road descending in about two miles one thousand feet, and in the next five miles ascending two thousand feet, to the top of ridge.

Thus it will be seen that in order to reach the summit of Sierra Nevada, a Railroad line must avoid the crossings of any of the canons; for were it even practicable to follow down into them with a grade of one hundred feet per mile, it would still be necessary to retrace the line upon the opposite side, which would involve (in a canon of, say, one thousand feet in depth) the additional length and cost of twenty miles of line of maximum grade, with the crossings of side ravines and tributaries.

The *present line* pursues its course along an *unbroken ridge from base to summit of Sierras*, the only river crossing in the mountains being Little Bear River (a tributary of Main Bear River, about three miles above Dutch Flat), which is crossed at an elevation of fifty feet, and will require only about fifty feet span of bridge.

THIRDLY. IN ITS ENTIRELY AVOIDING THE SECOND SUMMIT OF THE SIERRA NEVADA MOUNTAINS.

A cross section of the main range of Sierra Nevada presents a profile showing two summits, with a range of elevated table-land lying between; thus, upon the profile of Lieutenant BECKWITH'S survey across the Sierra Nevada *via* Madelin Pass, are shown two distinct summits, thirty-five miles apart, with a range of elevated table-land between them.

The present Placerville wagon road to Washoe also crosses these two summits; passing the first range *via* Johnson's Pass, it descends into Bigler Lake Valley, and ascending again, crosses the second summit *via* Daggett's Pass, into Carson Valley.

Lake Bigler lies in this valley between the two summits—is about 35 miles long, and from 12 to 15 miles in width; is entirely surrounded by mountains and lofty peaks, excepting at one point on its western shore, where the Truckee River forms its outlet.

Running at first north-westerly about eight miles, then northerly about ten, thence north-easterly about twelve miles, the Truckee passes down between these two summits with a nearly uniform fall of about thirty-five feet per mile; thence sweeping round to the eastward, it passes through the second range or summit, at a depression where it seems to be entirely worn away down to the level of the river, thence pursuing its way through an extensive plain known as the Truckee Meadows; thence through the Washoe Mountains to the Big Bend; thence northerly about twenty miles, finds its way into Pyramid Lake.

At the Donner Lake Pass, where our line crosses the first summit of Sierra Nevada, the altitude of line is about 1,200 feet above the Truckee River. Donner Lake lies immediately beneath, at a depth of 1,000 feet.

Two long side ranges or spurs inclose the lake and its valley, declining in hight gradually to the Truckee River, about eight miles below.

Our line is carried down along the side-hill of the spur or range immediately above the lake, and upon its south side to the Truckee River, which point it reaches in a distance of eleven and a half miles of line, with an uniformly descending grade of 105 feet per mile from the summit.

The Truckee thus reached, all further difficulty of location ceases, as it pierces its way through all obstructions with an uniform descent not exceeding forty feet per mile, to the Humboldt Desert, which forms the sink of the Humboldt and Carson Rivers.

Thus, the second summit of Sierra Nevada and the crossing of the Washoe Mountains are entirely avoided; and from the western base to the summit of Sierra Nevada, the grade is uniformly ascending or level, there being no descending grade going eastward; while from the summit to Big Bend of Truckee or Humboldt Desert, a uniform grade is likewise maintained.

THE PROMINENT FEATURES OF THIS LINE MAY BE BRIEFLY ENUMERATED AS FOLLOWS:

1st. It crosses the Sierra Nevada Mountains, and reaches the Truckee River, in 123, and State line in 145 miles from Saeramento.

2d. Big Bend of Truckee, or Humboldt Desert, is reached in 178 miles.

3d. It crosses the State at nearly its narrowest width.

4th. It pursues nearly a direct course from Sacramento to the Big Bend of Truckee.

5th. It forms a local road for the counties of Saeramento, Placer and Nevada.

6th. It commands and will perform the entire business of Nevada Territory, Washoe, and the Silver mineral region.

7th. It will also command the business of the newly discovered Humboldt mineral district, Pyramid Lake, Esmeralda, and Mono mineral districts.

8th. It crosses the Truckee Meadows at the head of Steamboat Valley, which, with Washoe Valley and Eagle Valley, connects with Carson Valley, enabling a branch road, with light grades, to be built to any point on Carson River.

9th. It reaches eastern base of Sierra Nevada in 11½ miles from Summit.

10th. It follows the valley of Truckee River, without obstacle, to Big Bend, or Humboldt Desert.

11th. It entirely avoids the second summit of Sierra Nevada.

12th. Its maximum grades are 105 feet per mile, or less than those of the Baltimore and Ohio Railroads.

13th. The grades down the Truckee will not exceed 40 feet per mile.

14th. The elevation of line is maintained, continuously to the summit—there being no down grade running easterly to Summit.

15th. An uniformly descending grade is maintained from the summit easterly to the Truckee, or eastern base.

16th. Encounters no elevated plateau of table-land at Summit.

17th. Running to and from summit with maximum grades, cannot have an extensive snow-line.

18th. Runs through extensive forests of Pitch and Sugar Pine, Fir, Cedar, and Tamarae, which latter two species of timber are abundant, and will furnish excellent cross-ties.

19th. Crosses no deep river canons or gorges.

20th. Its longest tunnel will not exceed 1,350 feet in length, and no shafting will be required.

21st. Shortest radius of curvature, 573 feet.

22d. Navigable waters of the Sacramento River at all seasons of the year its western terminus; Washoe and the Great Basin its eastern terminus.

23d. At Big Bend of Truckee, the line is in position to proceed *via* the Humboldt to Salt Lake, or follow the Simpson route to some point.

24th. *Saving in distance* over route *via* Madelin Pass and headwaters of Sacramento, as surveyed by Lieut. BECKWITH, from Lasseur's Meadows, or Humboldt crossing, 184 miles.

25th. Saving in cost of Pacific Railroad line, taking Lieut. BECKWITH's estimate from Lasseur's Meadows, or Humboldt crossing, as compared with cost of present proposed line, in thirteen and one half millions of dollars.

26th. Reduces the time of passenger transit to and from Washoe to 8½ hours. Passengers leaving Virginia station at 5 A. M., will reach San Francisco the same evening.

27th. Saving in cost of transportation of freight to citizens of Washoe or Nevada Territory, one million of dollars per year.

28th. Affords a market for low-class silver ores (now thrown aside), for shipment to Europe, from over 3,000 mining claims.

29th. Is advantageously located for an extension to Oregon.

30th. Completes first western link of Pacific Railroad, overcoming its greatest difficulties.

GENERAL REMARKS CONCERNING LOCATION AND DESCRIPTION OF RIDGE OR DIVIDE.

This divide is the strip of land lying between the American River and its North Fork (on the south), and Bear River and the South Yuba (on the north).

The American River unites with the Sacramento River at the city of Sacramento; Bear River unites with Feather River (a tributary of the Sacramento) about 30 miles north of the city of Sacramento.

The direction of divide is north-easterly and south-westerly. Its width opposite Sacramento is about 30 miles.

The foot-hills of Sierra Nevada begin at Folsom, on the American, and at Johnson's Ranch on Bear River; the line of foot-hills running through or near Lincoln (about 15 miles northerly, from Folsom, and 10 miles, southerly, from Johnson's Ranch), forming a piece of land in Sacramento Valley, between the foot-hills and Sac-

ramento River, of about 30 miles in length and 20 in width. The ravine of Bear River, from Johnson's Ranch to English Bridge (a distance of about 15 miles), pursues nearly an easterly course, while the course of the ravine of American River, from Folsom, is nearly north, to a point within about 8 miles (south-easterly), from English Bridge. Here the American River branches, and the ravine of its north fork, as well as that of Bear River, pursue a north-easterly course, but gradually approach each other to a point about four miles above Illinoistown, called Long Ravine, where the two rivers are less than three miles apart.

At this point occurs the greatest depression on the ridge, and the greatest difficulties in location were found.

From Long Ravine, the ravines of these rivers diverge somewhat, but are scarcely further than six miles apart at any point—the ravine of North Fork and its tributaries and branches continuing up to the summit.

Numerous branches and ravines extend northerly from the North Fork, rendering a location on that side extremely difficult, if indeed practicable, our line at Long Ravine being about 1,200 feet above the bed of North Fork. The ravine of Bear River extends up about fourteen miles above Dutch Flat, widening out near the source of Bear River into a beautiful valley, called Bear Valley, about two miles long and one mile wide. Diminished in size to a small creek, Bear River passes through this valley, and a mile above, is lost among the benches to the right. The ridge between Bear Valley and North Fork of American is about 800 feet high.

Here occurs a singular freak of nature. The South Yuba, augmented by numerous large branches along its course, is seen emerging from impassable rocky canons, and sweeping down through the head of Bear Valley, it turns suddenly to the north and pierces the ridge or divide lying north of Bear Valley, forcing its way out to the northward, between rocky walls, surmounted by peaks from 2,000 to the 3,000 feet high.

There is little doubt, that at some former period, the waters of South Yuba flowed through Bear Valley, and down the ravine of Bear River; and, indeed, it would be no difficult matter, to turn the whole volume of South Yuba into Bear River at the present time.

The South Yuba Canal Company, who supply the Nevada divide with water for mining purposes, take their water from the South

Yuba, at the head of Bear Valley, bringing it down through Bear Valley by the side of Bear River, with a grade of about ten feet per mile, being, at points, as near as 200 feet to Bear River, and not over fifteen or twenty feet above it. Thus, it will be seen, that the canon of Bear River becomes, and is the same as that of the South Yuba, which latter river now takes its place, the divide or ridge being now bounded by North Fork of American on the south, and South Yuba on the north.

The ravine or valley of South Yuba continues on to the summit of Sierra Nevada, and in Summit Valley, within two miles of Summit, the river is a larger stream than is Bear River in Bear Valley.

A barometrical examination of this route indicated that the top of ridge or divide could be reached at Clipper Gap, near the head of Dry Creek, 48½ miles from Sacramento. From this point to Reservoir Gap (about 1½ miles above Dutch Flat, and 25 miles from Clipper Gap), it was found that the line must be carried on the top of ridge.

The line of top or crest of ridge being far from uniform, of course the lowest points or gaps in ridge become commanding points, and it was found necessary to carry the line from gap to gap, passing around the intervening hills, upon their side slopes.

It was also found, upon reaching New England Gap (near the New England Mills, about six miles from Clipper Gap), that to Long Ravine, a distance of eight miles, the ridge was nearly level, the elevation of a grade at Long Ravine being only about 100 feet higher than at New England Gap.

Also that the ridge rose rapidly from Long Ravine, eastward to the next gap (called Secret Ravine Gap).

It was also found that from Reservoir Gap (1½ miles above Dutch Flat) the ridge rose too rapidly for one maximum grade, and that for the next 20 miles, to the bottom or valley of Yuba, the line must be carried on the main slope of Bear and Yuba Rivers. It was thought, however, that the line could be carried up Canon Creek (a tributary of North Fork, with tolerably smooth side slopes), to Dutchman's Gap, about eight miles above, and there cutting through the gaps, brought out on to Bear River side-hill.

Subsequent examination proved this to be impracticable. Canon Creek rising too rapidly for our grades, we were therefore compelled to carry the line immediately on to Bear River side-hill, and

were fortunate enough to be able to avail ourselves of the side-hill of Little Bear River for that purpose.

Being on the top of ridge at Reservoir Gap, we were enabled to cross Little Bear River near its head, and to use its side-hill for an approach to Main Bear River.

The barometrical elevations also indicated that the Yuba could be reached about twenty miles above Dutch Flat, at the head of its canons, and the line carried along up its smooth, uniform bottoms for some distance; then, by taking to its south side-hill, Summit Valley and summit reached with maximum grades.

The South Yuba, from this point (twenty miles above Dutch Flat), called Yuba Bottom, extends to the summit, a distance of sixteen miles, most of the way through a valley, in some places 500 or 600 feet wide. The old Truckee emigrant trail follows down through the valley a portion of this distance, generally over a smooth natural road.

Were the fall of this river evenly distributed, it would afford a uniform grade of a little less than 100 feet per mile to the summit.

Rising, however, from Yuba Bottom (say half a mile at a grade of fifty feet per mile), the river canons for half a mile at a steeper grade; thence for four miles its grade is about sixty feet per mile; it then canons, rising about 250 feet in a mile, at a point called Slippery Rock Canon.

The river then rises gently for about three miles, and again rapidly for three miles, to Summit valley.

Through Summit Valley (a distance of two and a half miles) its grade is scarcely twenty-five feet per mile, then rises rapidly again to the summit.

Inasmuch as the indications of altitude of the aneroid barometer proved lower than those of the true level, after continuing our line for six miles along the Yuba bottom, we were obliged to retrace our steps and commence again near Yuba Bottom, running up on south side-hill of Yuba, with maximum grade, into Summit Valley, in order to attain a sufficient elevation to reach the summit.

Summit Valley is a beautiful valley, near the source of the Yuba, about two and a half miles long and three-quarters of a mile wide, yielding excellent pasturage for cattle, hundreds of which are driven there each summer.

From the summit looking easterly, you appear standing upon a nearly perpendicular rocky wall, of 1,000 feet in hight.

Immediately below is seen a valley, from one to two miles wide, extending up from the Truckee River, to nearly beneath your feet. Donner Lake, (about three and a half miles long, by one mile in width) occupies the upper portion of this valley, and its outlet is seen pursuing its course down to a junction with the Truckee. Two long ranges or spurs are seen, on either side, parallel with and inclosing the lake, reaching from the summit to Truckee River. Immediately beyond the river is seen the second summit of Sierra Nevada, while still further in the distance the Washoe Mountains are plainly visible.

Passing the summit, our line is carried down upon the side-hill of the range, on the south side of Donner Lake, descending with the maximum grade for about eleven miles.

The distance, in a direct line, from Summit to Truckee River, does not exceed eight miles: but we fortunately encountered two long ravines, with smooth side-slopes, which, with the sinuosities of side-hill, gave about three additional miles of distance, enabling us to reach the Truckee with maximum descending grades.

PARTICULAR DESCRIPTION OF LINE.

Commencing at the city of Sacramento, the line will cross the American River about half a mile above Lisle's Bridge; thence pursuing a north-easterly course, for twenty-five miles, across the Sacramento Valley, it reaches the town of Lincoln, or intersection with the California Central Railroad, which point is at an elevation of 140 feet above the top of the levee at Sacramento.

From Lincoln the line follows up an indentation or bay, in the foot-hills, with grades not exceeding 50 feet per mile (passing half a mile north of Virginia), to Barmore's, thirty-one miles from Sacramento (elevation, 340 feet above Sacramento), from which point grades of 84 feet per mile are first used.

Continuing on up the southerly bank of Doty's Ravine (passing about one mile north of Gold Hill), the line crosses Doty's Ravine, running down the north side of same for about one-quarter of a mile with ascending grades; thence, turning to the right, it crosses the traveled road, near Dutch Colonel's House, and passes up the upper portion of what is known as Shipley Ravine.

Thence crossing north-easterly corner of the old Boyen Ranch,

it follows northerly (near the line of what is known as Sailor's Ravine Ditch), at the base of the foot-hills, to Sailor's Ravine.

Running up Sailor's Ravine, about one-third of a mile, the line crosses the same, and, turning to the left, it passes about 300 feet east of Moore's House; continuing on, up a branch of Sailor's Ravine, to a point called Bar Summit, having attained an elevation of 660 feet above Sacramento.

Thence winding about between the heads of small ravines, it crosses near the head of Taylor's and Sedergest Ravines, and passing about two-thirds of a mile north of Taylor's House, reaches the side-hill of Dry Creek.

Passing up the south-side-hill of Dry Creek, the line follows up two tributary ravines a short distance, to a favorable crossing, and in a short distance further strikes another tributary, called Deadman's Ravine.

This ravine, presenting a smooth side-hill, the line continues up the same about half a mile, to a favorable point, where it crosses, at a hight of about 45 feet.

Pursuing its course down the east side-hill of Deadman's Ravine, it strikes again the main side-hill of Dry Creek, following the same to the point where it breaks from its smooth, uniform valley, into rocky canons; thence up Dry Creek about two and a half miles, to the Auburn and Nevada Stage Road.

From the Nevada Stage Road to Clipper Gap (a distance of six miles), the line follows up the valley of Dry Creek, with grades varying from 50 feet to 105 feet per mile. (At one point on the profile, a grade of 116 feet per mile will be observed. This is the grade upon the line, as run; but a slight alteration of line will reduce it to 105 feet.

From point where Dry Creek canons to Clipper Gap, the line passes up and near to Oert's House, Page's, Redwines, passing under the flume of Bear River Ditch, and crossing Wyman's Turnpike and Auburn and Nevada Stage Road at Hawes' Store.

Thence passing over lands and near the dwellings of Wells, Gilbert, Cook, Kingsley, Cogswell, Watson, Buckley, and Neil, it reaches Gasorway's, or Golden Gate Hotel (passing about 25 feet in front of Gasorway's house).

Here the stage road forks, one branch following up a side ravine to the left, over Tunnel Hill, and *via* Empire Mills to Illinoistown,

while our line continues to the right, up Dry Creek, about a mile further, passing about 200 feet in front of Predmore's house.

Here, instead of following Dry Creek further (it rising too rapidly for our grades), we cross a gap to the right, called Clipper Gap, and run up the north side-hill of Clipper Ravine, (a tributary of North Fork of American), to Wild Cat Summit, crossing several short, steep side ravines.

Passing through Wild Cat Summit (about one-quarter of a mile south of Widow Hawes' house), we pass around Hawes' Hill, and curving to the left, cross the main road, and pass up a smooth ravine to the top of the ridge, at a point called Applegate Summit.

A short distance further on, the line passes through Evergreen Gap, crossing the divide again at Baney's Gap, from which point it curves round on side-hill (on North Fork side) to Star House Gap, near the Star House.

Here the line crosses Star House Gap (and the traveled road) about 50 feet high, passing up very nearly on top of divide, to the head of Applegate Ravine, which runs into Bear River, this point being called New England Gap.

From New England Gap the line passes out upon north side-hill of North Fork.

Crossing the traveled or Stage Road, it runs along above the same, and about 500 feet above New England Mills, through peach orchard of Murphy; through Manzanita and Chaparral Gaps, and over Sugar Loaf Summit to Lower Illinoistown Gap, at the point where upper stage road crosses the gap (about one and a quarter miles below Illinoistown.)

Crossing this gap, about 30 feet high, the line continues on about half a mile further, over a broken country, to a point called Bear River Gap, where it turns abruptly to the left, with maximum curve, and crosses the ridge with a tunnel of 500 feet in length, emerging on the south side-hill of Bear River, along which it pursues its course to Storm's Gap and Long Ravine Gap, leaving Illinoistown about one mile to the right.

Here was found the greatest difficulty in location; Long Ravine Gap being an unusually low depression, the ridge beyond rising quite rapidly to attain its average elevation.

Here the line crosses gap, about 70 feet high, and curving to the right, follows the side-hill of Rice's Ravine (leading to North Fork) for about one mile, encountering a succession of short, steep,

abrupt side ravines, to Cape Horn, which is a bold, rocky bluff, nearly perpendicular, and 1,200 feet high, above the North Fork of American.

Passing round the face of this bluff, about 200 feet below the table above, we strike the side-hill of Robber's Ravine, which runs parallel to Rice's Ravine, and continues up along the side-hill of same for about one and a half miles, crossing Oak Summit, and passing about three-quarters south of Madden's Toll House, through Trail Summit.

From this point the line follows along the face of side-hill above North Fork, striking Secret Ravine, along which it runs for about one mile, when, turning to the left, it passes up a tributary side ravine to its head, the line striking a point about two hundred feet south of stage road, one mile south of Secret-town.

Running thence, along side of road nearly a mile, it crosses the same, and passing between Everhart's house and barn, at Secret-town, it reaches the head of Secret ravine, or Secret-town Gap, crossing it with trestling, about 50 feet in hight.

Turning to the left, the line now passes north of Cold Spring Mountain (on Bear River side), and for two miles encounters a succession of steep side ravines, where some of the heaviest work on the line will be found. Two tunnels will be necessary on this piece of line, each about 600 feet in length.

Leaving the side-hill again, the line strikes a long and nearly level bench, about two miles in length, extending up nearly to Dutch Flat.

This bench is the well known gravel ridge which extends along the slopes of the Sierras at about this elevation, and on which are situated the mines worked by the hydraulic mining process.

Extending up this ridge to within about one mile of Dutch Flat, the line again takes to side-hill to left, running near to Strong's Cabin, Brickell's Steam Saw Mill, Dutch Flat Steam Saw Mill, to the Dutch Flat Water Company's large reservoir (about one and a half miles above Dutch Flat).

The town of Dutch Flat lies on Bear River side-hill, about half way down to Bear River, the line passing about half a mile in the rear, and about 300 feet higher than the town.

At this last named reservoir, which is upon the top of ridge (called Reservoir Gap), we leave the crest of ridge for the last time,

it rising too rapidly to be available for a railroad line at our maximum grades.

Turning to the left, the line now runs at nearly a level grade, about one and a half miles further to Little Bear River, which stream it crosses just above the Saw Mill, near Widow Homer's Ranch.

Pursuing its course down the north side-hill of Little Bear River, it departs at Ellmore Hill, passing round the same, and enters upon the side-hill of Bear River.

The river gorge at this point is about 1,500 feet deep—our line being about 500 feet below the top of ridge, and from 1,000 to 1,200 feet above the river. Its side-hill is steep, rocky, and marked by many abrupt indentations and corresponding salient points.

The line was carried *round* most of these points; but upon a final location, it will probably be found advisable to run through the sharp points with short tunnels—the longest of which will be 1,350 feet—none of them, however, requiring shafting.

The line passes up this side-hill of Bear River (the grade line being nearly parallel with the crest or top of the ridge, and from 500 to 700 feet below the same), crossing through Zerr's Ranch (about 600 feet north of his buildings), striking the lower end of Bear Valley, about 200 feet high, on its south side-hill.

Continuing on for two miles, it leaves the head of Bear Valley, at an elevation of about 350 feet on side-hill above the same, crossing the head of Bear River (which is here but a small creek), following it up to its source, which is in a marshy lake, about one and a half miles above Bear Valley.

It will be observed on the profile, that from Zerr's Ranch to head of Bear River a grade line is indicated, running about 100 feet higher on the side-hill.

In locating the line as run, the intention was to cross Bear River, and continue on the side-hill of the main gorge to Yuba River (near head of South Yuba Water Company's Canal), keeping up on main side-hill of South Yuba to Yuba Bottom; but upon examination, this proved to be impracticable, the Yuba above Bear Valley running in deep rocky canons, with perpendicular rocky walls of granite, too rugged in their character to admit of the location of a line over them.

It therefore became necessary to carry the line on to a bench above and south of the Yuba River, and nearly at the base of main

Ridge—a line from Zerr's Ranch to this point being praetieable at our maximum grade, the only change necessary being to make the loeation a little higher on side-hill.

Our present line passes about 100 feet to the left of Jew Davids' Cabin. On the location as ehanged, it will pass a short distance in the rear of same.

Continuing on, the line pursues the general course of Yuba River, about six miles further, to the point where old Truekee emigrant trail leaves Yuba Bottom to ascend on the main ridge to the south (whieh point is 19 miles above Dutch Flat by trail, and about 22½ miles by our line), called Yuba Bottom.

This point is at the head of the lower eanons and falls, between Yuba Bottom and Bear Valley.

In subsequent loeation, it will be necessary to run the line between these two points, (viz., head of Bear River to Yuba Bottom) a little lower down on side-hill, as indicated on profile, for the following reasons: Fearing that the elevation of Yuba Bottom might prove too high, the line was run from head of Bear River, at our maximum grade, in order to gain as much elevation as possible. But on reaching Yuba Bottom, it was found that this gave more elevation than was necessary; therefore the last half mile of line was run down on to Yuba Bottom. The last elevations show, that a grade of 80 feet per mile ean be obtained from the head of Bear River to Yuba Bottom.

From this point (Yuba Bottom), the line follows the river for about one mile, passing through a short canon, and emerging at very near the level of water surface in river (called Hall's Canon.)

From this point the line was first run for about six miles up the river valley, taking to side-hill at the two upper canons, the line being earried up to the upper ford, at head of Wilson's Cut-Off; but finding that the summit could not be reaehed without increasing grade on the remaining distance, our parties proceeded to summit, from which a line was run down on south side-hill of Yuba, at maximum grade, striking into the valley line, at head of first small canon (about one mile above Yuba Bottom), ealled Hall's Canon.

The loeation, therefore is carried from Hall's Canon, on South side-hill of Yuba, at maximum grades, into lower end of Summit Valley (about 3½ miles below summit of Sierras), erossing the old Truckee Emigrant Trail, near Kidd's Reservoir, about half way up to the top of ridge, the line striking the lower end of Summit Val-

ley, about the level of Yuba River; running thence straight across Summit Valley, about two miles, at a grade of about 25 feet per mile, to a point on the south side of Summit Valley, near Cook's old cabin, the line takes to side-hill on the right, and in 1½ mile further reaches the summit of Sierras, with a cutting of about fifty feet.

By commencing the last named ascent a little further back in Summit Valley, the summit can be reached with maximum grades without any excavation. The elevation of surface at summit is 7,027 feet above top of levee at Sacramento.

DESCENT ON EASTERN SIDE OF SIERRA NEVADA.

Pursuing its course from the summit easterly, the line commences its descent with maximum grade, and, passing to the right, is carried for next two miles over a steep, rocky side-hill, on which will be found quite heavy rock cutting: thence turning abruptly to the right, it enters upon side-hill of Strong's Ravine, and, running up the same, about one mile, crosses over, and is carried down over a smooth side-hill, to a point 600 feet higher than the south-west corner of Donner Lake, thence pursuing its course along the side-hill for about three miles, it encounters Coldstream Ravine, and runs up the same a little over a mile.

Crossing Coldstream, the line follows along down its south side-hill to within about a quarter of a mile of the Main Truckee, where turning to left, it crosses the valley of Donner Creek, accomplishing the descent in about 11½ miles of downward maximum grade. Thence the line was carried about five miles down the valley of Truckee River, and the survey terminated at a point 128 miles from Sacramento.

The object of this survey being to accomplish the crossing of the Sierras with a Railroad line, it was considered unnecessary, at this time, to extend the survey any further down the Truckee River; barometrical elevations were taken from our line up the Truckee River to Lake Bigler, and also down the same to the lower end of Truckee Meadows, showing its average fall to be only about 35 feet per mile.

I also carried a series of observations down Steamboat Valley to Steamboat Springs, thence across the Washoe Mountains (*via* Virginia, Flowery and Six Mile Canon) to the Carson River, thence

down the same to Fort Churchill—a profile of which is shown on the small, general profile of grades.

A continuation of our line down the Truckee to Big Bend follows the same, from terminus of survey, 13 miles, to Neil's Ranch, or Henness Road; thence 7 miles to Stout's crossing of Truckee; thence through the Truckee Meadows and across head of Steamboat Valley eight miles to Stone's crossing or Western base of Washoe Mountains; thence 23 miles, through Washoe Mountains, to Big Bend of Truckee, or edge of Humboldt Desert, making the total distance about 178 miles.

No obstacle exists, and a line, with light grades over exceedingly smooth surface, can be carried from Stout's crossing of Truckee, up Steamboat Valley, to its head; thence through Washoe Valley into Eagle Valley, which opens into Carson Valley; thence down the Carson River to Fort Churchill, or edge of Desert, making, however, a longer line than that down Truckee.

GRADES.

The following table of grades extends from Lincoln (a point 25 miles from Sacramento) to terminus of survey, on Truckee River, a point about 16 miles easterly from summit of Sierra Nevadas.

TABLE OF GRADES.

LENGTH OF PLANE, FEET.	GRADE ASCENDS PER MILE.	GRADE DESCEND PER MILE	LENGTH OF PLANE, FEET	GRADE ASCENDS PER MILE.	GRADE DESCEND PER MILE.	LENGTH OF PLANE, FEET	GRADE ASCENDS PER MILE.	GRADE DESCENDS PER MILE.
3,000	9	.....	4,000	53	.....	500	Level	.....
3,000	53	.....	6,750	105	.....	5,000	79	.....
1,000	Level	.....	18,250	Level	.....	3,000	105	.....
3,000	45	.....	3,000	105	.....	3,000	79	....
4,500	Level	.....	1,000	Level	.....	38,000	105	.....
6,500	45	.....	6,000	36	.....	2,000	Level	.....
4,000	36	.....	13,500	Level	.....	1,000	53	.....
4,300	53	.....	17,500	105	.....	25,000	79	... .
6,300	79	.....	1,000	Level	.....	2,750	26	.....
3,200	Level	.....	3,500	105	.....	3,500	105	.....
500	53	.....	1,000	Level	.....	2,000	Level	.....
12,700	84	.....	3,500	105	.....	57,500	105	.....
3,300	Level	.....	1,000	53	.....	1,750	53	.....
5,000	84	.....	2,500	105	.....	2,500	Level	.....
6,000	65	.....	2,000	Level	.....	13,750	105	Summit
7,100	84	.....	13,000	105	.....	45,000	.....	105
1,300	53	.....	1,000	Level	.....	1,750	.....	Level
2,500	105	.....	1,000	53	.....	15,250	.....	105
1,800	26	.....	4,000	Level	.....	2,500	.....	Level
17,250	75	.....	17,000	105	.....	6,500	.....	53
1,000	53	.....	1,250	Level	.....	3,200	.....	39
1,000	75	.....	1,000	79	.....	2,750	.....	Level
1,700	105	.....	1,000	Level	.....	3,500	.....	39
2,500	75	.....	4,000	53	.....	1,000	.....	53
2,000	105	.....	14,000	105	.....	2,000	.....	39
2,000	65	.....	3,000	53	.....	.....	.....	... .
3,000	105	.....	4,000	79	.....	.....	.....	....
15,000	116	.....	10,500	105	.....	.....	.....	.....
11,000	105	.....	1,000	53	.....	.....	.....	.....

SUMMARY OF GRADES.

GRADE. FEET PER MILE.	MILES ASCENDING.	MILES DESCENDING.
9	0.56	
26	0.86	
36	1.89	
39		1.04
45	1.80	
53	5.08	1.42
65	1.53	
75	1.38	
79	8.39	
84	8.03	
105	43.08	11.41
116	2.84	
Level	11.19	1.33
Total distance Lincoln to Summit	87.63	15.20

From which it appears that upon the western slope:

No. of miles of Ascending grade 116 ft. per mile } ...2.84 miles.
No. of miles of Ascending grade 105 ft. per mile } ..43.08 "
No. of miles of Ascending Grade 84 ft. per mile.....8.03 "
No. of miles of Ascending Grade 79.75 ft. per mile...9.77 "
No. of miles of Ascending Grade 65 ft. per mile.....1.53 "
No. of miles of Ascending Grade 53 ft. per mile.....5.08 "
No. of miles of Level.....11.19 "

While upon the eastern side, or descent, there are 11.41 miles of grade, of 105 ft. per mile.

The total elevation of grade overcome at Summit is 7,000 feet.

That the elevation overcome in crossing the summit of Sierra Nevada is greater than that upon any other line of road in the United States, is true. But it is no less true that the grades employed in reaching the summit, are less than the maximum grade employed on important roads in the United States; the Pennsylvania Central having ten miles of grade of 95 feet per mile, while the Baltimore and Ohio Railroad has one plane, 15 miles in length, on which are 11½ continuous miles of grade of 116 feet per mile, and 3½ of 100 feet per mile. A portion of the Virginia Central Railroad was operated successfully a period of five years over two

miles of grades of 300 feet per mile, with curves of 300, and one as small as 238 feet radius—with a 30-ton locomotive engine.

By referring to the above table of grades, it will be seen that the longest piece of continuously ascending maximum grade of 105 feet per mile, is about 10 miles; all of these heavy grades being relieved at frequent intervals by lesser grades or levels. So that on no portion of the road will there be so long a piece of continuously ascending grade of 105 feet per mile, as upon the 116 feet grades of the Baltimore and Ohio Railroad.

It is deemed unnecessary, here, to enter upon a calculation of the effective power of locomotive engines upon different gradients, General McClellan having given very full notes of the results of his investigations upon the subject, in his memoranda on P. R. R., published in the Report of the Secretary of War upon P. R. R. Surveys. The following extracts from his Report are given here:

"On the Pennsylvania Central Road, are gradients of 95 feet per mile, for 9¾ miles. Passenger trains ascend this grade with a velocity of 24 miles per hour, and descend at 20 per hour.

"The working load of the heavy freight engines (weighing 65,000 lbs., on eight drivers), on the 95 feet gradient, is 125 tons net, or about 208 tons, including tender and cars."

Of the Baltimore and Ohio Railroad, he says:

"The most interresting and analogous case, however, to which I can refer, is that of the Baltimore and Ohio Railroad, one of the great lines in the United States, alluded to in a previous part of this article, as connecting the seaboard with the valley of the Mississippi across the Alleghany Mountains. In the year 1850, 447,000 tons of merchandise and 180,000 passengers were transported on this Road, the receipts amounting to $1,343,000, the road being only about half completed. When finished to the Ohio river, the receipts are expected to amount to $3,000,000. On this road are heavy gradients, with several curves of 600 feet radius, and some of four hundred feet. It is to the mountain district of the road just opened, that I wish particularly to invite attention, and for this purpose an extract is made from the official report of the Chief Engineer, Mr. Latrobe, one of the most distinguished engineers of North America, in which he describes the route and grades over the Alleghany Mountains."

"At about a mile below this point, the *high grade of* 116 *feet per mile begins and continues about* 11½ *miles*, crossing the Potomac from Virginia into Maryland near the beginning of the grade, and thence ascending the steep side slopes of Savage river and Crab Tree Creek, to the summit, at the head of the latter, a total distance of about 15 miles. Upon the last three and a half miles of which, the grade is reduced to about 100 feet per mile. From the summit, the line passes for about 19 miles through the level and beautiful tract of country, so well known as the Glades, and near their western border the route crosses the Maryland boundary, at a point about sixty miles from Cumberland, and passes into the State of Virginia, in whose territory it continues thence to the terminus on the Ohio. From the Glades, the line *descends by a grade of* 116 *feet per mile, for eight and a half miles*, and over very rugged ground, and thence three and a half miles further to Cheat River, which it crosses at the mouth of Salt Lick Creek. The route, immediately after crossing this river, ascends along the broken slopes of

the Laurel Hill, by a *grade of* 105 *feet per mile for five miles*, to the next summit, passing the dividing ridge by a tunnel of 4,100 feet in length; and whence, after three miles of light grade, a descent by the *grade of* 105 *feet per mile for five miles* is made to the Valley of Raccoon Creek, by which and the Valley of the Three Forks Creek, the Tygarts Valley River is reached in fourteen miles more, at the Turnpike Bridge above described, and 103½ miles from Cumberland."

Upon the Virginia Central Railroad, the Alleghany Mountains were crossed with grades of 296 feet per mile, and the road operated successfully a peried of over five years.

Reference is had to a pamphlet published by CHAS. ELLET, Esq., the Engineer of the road, who says:

EASTERN SIDE.

"The length of descent, from summit to foot of grade, on eastern side, is 2 37-100 miles.

"The road descends in this distance 610 feet.

"The average grade is, therefore, 257 feet per mile.

"The maximum grade is 296 feet per mile.

WESTERN SIDE.

"Length of descent 2 2-100 miles.

"Road descent in this distance 450 feet.

"Average grade is 223 feet per mile.

"Maximum grade is 280 feet per mile.

"On both sides of mountains, the ruling curves are described with a radius of 300 feet, on which the grade is 237 feet per mile."

"The admirable engines relied on to perform the extraordinary duties imposed upon them in the passage of this summit have failed *but once* in this period—2½ years—to make their regular trips. The mountain has been covered with deep snow for many weeks in succession, and the cuts have been filled, for long periods, many feet in depth, with drifted snow; the ground has been covered with sleet and ice, and every impediment due to bad weather and inclement seasons has been encountered, and successfully surmounted in working the tracks.

"The total weight of engines is 55,000 lbs., or 27½ tons, when the boiler and tank are supplied with fuel and water enough for a trip of eight miles."

"Ascending engines stop daily on a grade of 280 feet per mile, and are there held by the brakes, while the tanks are being filled, and are started again, at the signal, without difficulty."

With the practical experience afforded by the workings of these roads, it may be safely assumed, that a thirty-ton engine, with eight drivers, will ascend the maximum grades of this road with an ordinary passenger train at a speed of twenty miles per hour.

That an engine of the same class will ascend these grades, with a freight train weighing 150 tons, at a speed of 13 miles per hour.

The following is taken from memoranda of Gen. MCCLELLAN on subject of Pacific Railroad:

Calculations for a 30-ton Engine on 6 drivers, total adhesive weight..67,200 pounds.
By formula 1, maximum load on a level is ..... 1,680 tons.
By formula 2, maximum grade up which this engine can draw a load of 76 tons is..... 401 feet.
By formula 4, the maximum grade for same load is..... 281 feet.
By formula 1, the maximum load for grade of 150 feet is..... 186 tons.
By formula 3, the maximum load for same grade is..... 133½ tons.
By formula 1, the maximum load for grade of 200 feet is ..... 146 tons.
By formula 3, the maximum load for same grade is..... 104½ tons.

COMPARISON OF ELEVATIONS OVERCOME.

Route.	Length. Miles.	Summit Elevation. Feet.	Total Rise and Fall. Feet.	Max. Grade. Feet.
Boston route	500	1,440	4,700	83
N. Y. Central	400	650	2,100	30
N. Y. and Erie	460	1,720	6,500	70
Philadelphia route	340	2,400	5,600	95
Baltimore route	390	2,700	7,000	116
Charleston route	490	1,400	5,000	40
Savannah route	440	1,400	5,000	40
Santiago	110	2,640	4,340	119
Central Pacific	140	7,000	8,800	105

It will thus be seen, that the sum of ascents and descents upon this line are but 1,800 feet more than upon the Baltimore and Ohio Railroad, our line crossing a summit of 7,000 feet, the elevation of summit on that road being only 2,700 feet.

The small per centage of total rise and fall upon this line, as compared with the altitude of summit, is due to the fact that there are no undulatory grades—the rise and fall is constant, no elevation being lost.

GRADES ON LIEUT. BECKWITH'S ROUTE FROM LASSENS TO SALT LAKE, 451 MILES.

The following in a statement of grades from Lassens to Salt Lake, taken from Lieut. Beckwith's Profile, assuming his projected improvements in location:

	Miles.	Ascending Grade, Feet Per Mile.	Descending Grade, Feet Per Mile.
Lassen's to Junction Main Forks of Humboldt	145	4	
Junction Forks to Creek	35	31	
To stream near Summit	8	89	
To summit Humboldt Mountains	1	25	
Summit to mountain stream	3		25
To Camp 16	8		58
To Camp 15	15	4	
To Camp 14	28	7	
To Camp 13	10		21
To Camp 12	20	Level.	
To Camp 10, Fish Creek	28		21
To Point on Fish Creek	16	Level.	
To Camp 8, Granite Mountains	40		10
To Camp 6	24	0½	
To Camp 5	15		12
To shore of Salt Lake	21		10
To Camp 3	13	18	
To Oquirrh Mountains, or opposite Salt Lake City	21	8	
	451		

The highest grade shown being 8 miles of 89 feet grade, which can probably be reduced to 50 or 60 feet per mile.

ALIGNMENT.

The first 25 miles of line from Sacramento to Lincoln will be generally straight. From Lincoln to Barmore's, or six miles further, the least radius of curvature will be 1,432 feet.

From Barmore's (or western base) to the Truckee River, or eastern base of Sierra Nevada, the line is mostly on side hill; there is, consequently, a preponderance of curved line rendered necessary by the sinuosities of side hill and projecting points.

The least radius of curvature, however, upon the line is 573 feet, or a ten-degree curve.

The Baltimore and Ohio Railroad has several curves of 600 and some of 400 feet radius. (See Report of General McClellan.)

The Virginia Central Railroad had curves of 300 feet radius, on which the grade was 237 feet per mile. One curve upon that Road had a radius of 238 feet. (See Report of Chas. Ellett, Esq.)

Curves of 500 feet radius are common upon many of our Eastern roads, and are safely traversed at a speed of 30 miles per hour.

For a particular description of the alignment of this road, atten-

tion is invited to the large map of location (scale 400 feet per inch) exhibiting each curve and tangent, with the length and radius marked upon it.

Also, to the tabular arrangement of the same, in which each curve and tangent is laid down, from which it will be seen that between Barmore's and Truckee River, a distance of 92 miles, there is of straight line:

No. of Curves of 573 feet radius	157
No. of Curves of 716 feet radius	65
No. of Curves of 955 feet radius	140
No. of Curves of 1,432 feet radius	65
No. of Curves of 1,910 feet radius	62
No. of Curves of 2,865 feet radius	23

From the eastern base of mountains to Big Bend of Truckee, the length of curved line will not exceed thirty per cent. of the whole distance, the curves being generally of over 1,500 feet radius.

Thus, it will be seen that the alignment of this road compares favorably with that of many of the most important roads of the Atlantic States.

SNOWS.

The argument of obstruction from snow having been frequently urged against the Central route for Pacific Railroad, I have taken much pains to arrive at correct conclusions upon this subject, and feel warranted in the statement, *that a Railroad Line, upon this route, can be kept open during the entire year* for the transaction of its business.

It is true that snow falls to a greater depth upon the elevated portions of this line than upon the lines of Railroads in the Atlantic States.

The depth at which snow lies upon this route is plainly distinguishable at any season.

The trees are generally covered with moss down to the level of the snow, and thousands of them can be seen entirely free from moss up to a certain hight, and almost entirely covered with moss from that hight.

Frequent marks have also been made by persons who have traversed the route on snow shoes, during the winter, by axe marks chopped in the tree at the level of the snow.

The limbs of the small trees also afford indications of the hight of snow; those limbs lying beneath the snow maintaining their original or natural position, while those above the snow-line are almost universally bent downwards, and not unfrequently broken by the weight of snow.

These observations lead to the conclusion that the greatest depth of undisturbed snow is 13 feet at the summit.

In places where drifts occur, the depth is of course greater, and at corresponding points, less than the average level.

This may, at first, seem to be a serious obstacle to the passage of Railroad Trains. But this depth of 13 feet is not the result of a single storm, but the *accumulation of a number of successive storms, occurring during the winter.*

Snow does not melt very rapidly at this elevation, during the winter.

A storm will occur, and snow fall to the depth, perhaps, of three or four feet.

Another storm will, perhaps, add two or three, or four feet to this depth.

Successive storms add to its depth; but it is believed that its highest level is not over 13 feet.

The town of Dutch Flat, 72 miles from Sacramento, and 40 miles from summit may be considered the foot of snow line on western side—snow seldom falling more than two feet there, and melting off in a day or two.

The average depth of snow at lower end of Donner Lake is about six feet.

At Neil's Ranch, on the Truckee River, 28 miles easterly from the summit, I am assured by Mr. Neil, that the greatest depth of snow last winter was 18 inches, and that during the five years he has lived there, it has not exceeded three feet in depth.

It may be safely concluded that the line of deep snows terminates where our line strike the Truckee River, or, say, 12 miles from the summit, making 52 miles of snow line.

It will also be remembered that our line is almost exclusively a *side-hill line*, from which the snow can be more easily removed than from a level surface.

It is only necessary, then, to start an engine with snow-plows, from the summit each way, at the commencement of a storm, clear-

ing the snow as it falls. A similar course of procedure at each successive storm, will keep the track open during the entire winter.

It is also stated that a crust soon forms upon the snow, which prevents its drifting badly.

The only point where we shall encounter a level surface of snow, is in Summit Valley, for about two miles.

By elevating the track at this point, no trouble need be anticipated.

The great dread, and real danger of a storm in the mountains, does not arise from the depth of snow, but from the entire absence of shelter and relief in the mountains, there being no houses or accommodations, excepting upon the wagon roads across to Washoe.

The Placerville wagon road is kept open for travel during the entire winter, hotels being established every few miles along the route. With a railroad built upon this route, this objection would also be entirely obviated.

TUNNELS.

Upon the line, as located, but four tunnels appear upon the profile, but upon further examination, it has been deemed expedient to cut through several sharp projecting points, instead of carrying the line around them,

It is estimated that the cost of these tunnels will not exceed the cost of the increased length of line around these points.

It will be observed that the tunnels are comparatively short, the longest being 1,370 feet in length; they can all be worked from either end, reducing the greatest consecutive length of tunneling to 685 feet.

They are in rock, generally granite, and require no shafting.

The cost of shafting in long tunnels is usually one-third the whole cost of tunnel.

Their lengths are as follows:

1	500	feet long.	1	1,300	feet long.	1	1,200	feet long.
1	600	"	1	1,370	"	1	1,100	"
1	800	"	1	1,250	"	1	400	"
1	1,200	"	1	1,300	"	1	1,070	"
1	1,000	"	1	1,370	"	1	1,100	"
1	1,100	"	1	300	"	1	450	"
						18	17,410	

Making 18 tunnels, with an aggregate length of 17,410 feet, costing, at $50 per linear foot, $870,500.

The longest tunnel can be excavated in thirteen months, at the rate of two feet per day.

The following statistics were given in report of Gen. McClellan to the Secretary of War, on Pacific Railroad:

Nerthe Tunnel, France—15,153 feet long; 24 shafts; aggregate length of which was 7,589 feet; deepest of which was 610 feet; in very hard limestone; dimensions, 29½ by 26¼ feet.

Its cost was as follows:

For mining body of tunnel	$705,982
For mining shafts	109,081
Masonry for shafts	49,069
Lining for body of tunnel	423,711
Cost of aqueduct	10,607
Total cost of tunnel	$1,298,450

Cost of mining main body of tunnel, $46.58 per linear foot.

Woodhead Tunnel, England—3½ miles long 5 shafts; 400 to 600 feet deep; rock, granite, or mill-stone rock; entire cost, $1,026,705; cost of tunnel, *including shafting*, $55 per linear foot. Excavated at the rate of eight feet per day.

Uppingham Tunnel—1,320 feet long; cost $40 per linear foot.

Black Rock Tunnel, Pennsylvania—1,932 feet long; rock, greywacke; six shafts; cost $77 per linear foot.

The cost per cubic yard of excavating tunnels in the United States, has been:

Lehigh, very hard granite	$4 36	per linear foot.
Schuylkill State	2 00	" "
Union State	2 09	" "
Blue Ridge Tunnel	4 00	" "

A section of tunnel, averaging 20+17 feet, contains, 12⅔ cubic yards per linear foot.

TIME CONSUMED IN MAKING THE TRIP WITH PASSENGER TRAINS FROM SACRAMENTO TO VIRGINIA STATION.

	Distance.	Speed per Hour.	Time.
Sacramento to Barmore's	31 miles.	31 miles.	1 hour.
Stoppage at Barmore's			:30
Barmore's Summit	81 miles.	20 miles.	4
Carried forward	112		5:30

	Distance.	Speed per Hour.	Time.
Brought forward.....	112		5:30
Four stoppages, 15 minutes each.....			1
Summit of Truckee River.....	11 miles.	15 miles.	:45
Stoppage			:15
Truckee to Neil's	17 miles.	34 miles.	:30
Neil's to Stone's & Virginia Station..	15 miles.	34 miles.	:30
	155 miles.		
Total time consumed in making trip.....			8:30

or 8½ hours.

A train leaving Sacramento at 6 A. M., would arrive at Virginia Station (13 miles north of Virginia) at 2.30 P. M., passengers reaching Virginia City at 4.30 P. M.; Gold Hill, 4.50 P. M.; Silver City, 5.15; Chinatown, 6.10, and Carson City, 7.15 P. M.

Freight trains leaving Sacramento at 6 A. M., would reach Virginia Station at 7 P. M., including all stoppages.

Returning, the passengers leaving Virginia depot at 5 A. M., would arrive in Sacramento in time to take the 2 o'clock boat, and arrive in San Francisco the same evening.

ESTIMATE OF COST.

The estimated cost of this road will be found to exceed the average cost of railroads in the Atlantic States, but is nevertheless a cheaper line than has been heretofore estimated for the crossing of the Sierra Nevada Mountains.

The rugged nature of the country over which the line passes, the character of the excavations (which for 90 miles are almost exclusively rock cuttings), the high cost of labor in California, the extra weight of rail (estimated at 75 lbs. per yard), with its cost of transportation to California, all tend to swell the cost of road beyond the average cost of railroads in the Atlantic States.

But when it is considered that this line accomplishes the crossing of Sierra Nevadas (by far the most difficult and expensive portion of the great line across our continent), is carried over an elevation of 7,000 feet in hight, entirely avoids the second summit of Sierra Nevada, saves 184 miles in distance, and $13,500,000 in cost to the Pacific Railroad, its cost of $88,000 per mile can scarcely be deemed high.

The Boston and Providence Railroad cost .....$81,273 00 per mile.
The Boston and Lowell Railroad cost..... 78,636 00 "
The New York and Erie Railroad, about..... 80,000 00 "
The Hudson River Railroad, about..... ..... 80,000 00 "

COST OF ROAD FROM SACRAMENTO TO STATE LINE, OR NEIL'S—140 MILES.

STATIONS.	Miles	Cost per Mile.	Totals.
Sacramento to Lincoln	25	$50,000	$1,250,000
Lincoln to Barmore's	6	60,000	360,000
Barmore's to Nevada Road	12	90,000	1,080,000
Nevada Road to Clipper Gap	6	50,000	300,000
Clipper Gap to Long Ravine	12	80,000	960,000
Long Ravine to Gravel Ridge	9	110,000	990,000
Gravel Ridge to Bear River	5	85,000	425,000
Bear River to South Yuba	21	100,000	2,100,000
Yuba to Hall's Canon	1	75,000	75,000
Hall's Canon to Summit Valley	11	100,000	1,100,000
In Summit Valley	2	75,000	150,000
To Summit Sierras	2	150,000	300,000
Summit to Strong's Canon	2	150,000	300,000
Strong's Canon to Truckee	10	100,000	1,000,000
Truckee to Neil's or State Line	16	70,000	1,120,000
Add eighteen tunnels	.....	.....	870,000
Total cost to State Line	140	.....	$12,380,000

Or an average cost of $88,428 per mile.

ADDITIONAL COST TO STONE'S CROSSING OF TRUCKEE OR VIRGINIA STATION—15 MILES.

STATIONS.	Miles	Cost per Mile.	Total.
Neil's to Stout's	7	$70,000	$490,000
Stout's to Stone's	8	50,000	400,000
Total cost	15		$890,000
Making total cost	155	.....	$13,270,000

ADDITIONAL COST TO BIG BEND OF TRUCKEE OR HUMBOLDT DESERT—23 MILES.

	Miles	Cost per Mile.	Total.
Stone's Crossing or Big Bend	23	$70,000	$1,610,000
Making total cost	178	.....	$14,880,000

Or an average cost of $83,600 per mile.

ADDITIONAL COST OF A RAILROAD LINE FROM BIG BEND OF TRUCKEE TO LASSEN'S MEADOWS, OR TO A CONNECTION WITH LIEUT. BECKWITH'S LINE ON HUMBOLDT RIVER—104 MILES.

	Miles	Cost per Mile.	Total.
From Big Bend of Truckee to Lassen's Meadows	104	60,000	$6,240,000
Making total cost to Lassen's Meadows	282	.....	$21,120,000

On an average cost of $74,900 per mile.

ADDITIONAL COST OF LINE FROM LASSEN'S MEADOWS TO SALT LAKE, TAKEN FROM ESTIMATES OF LIEUT. BECKWITH, P. R. R. REPORTS—451 MILES.

	Miles	Cost per Mile.	Total.
Lassen's Meadows to Salt Lake	451	$45,000	$20,295,000
Making total cost of line from Sacramento to Salt Lake	733	.....	41,415,000

On an average cost of $56,500 per mile.

ESTIMATED COST OF LINE FROM SALT LAKE TO COUNCIL BLUFFS, BY LIEUT. BECKWITH, P. R. R. REPORTS—1,125 MILES.

	Cost of Routes
Council Bluffs to Salt Lake, 1,125 miles	$58,485,000
Making total cost from Council Bluffs to Sacramento, 1,858 miles	99,870,000
For purpose of comparison, add cost from Sacramento to Benicia, 58 miles	2,630,000
Gives total length, Council Bluffs to Benicia, 1,916 miles. Total cost	102,500,000
Estimate by Beckwith's route, 2,100 miles. Total cost	116,000,000
Saving in distance, 184 miles; in cost	13,500,000

RECAPITULATION AND ESTIMATE OF ENTIRE COST OF PACIFIC RAILROAD LINE, TAKING LIEUT. BECKWITH ESTIMATES, FROM COUNCIL BLUFFS TO LASSEN'S MEADOWS, AND THENCE VIA THIS ROUTE TO SACRAMENTO—DISTANCE, 1,858 MILES.

	Miles.	Cost per Mile.	Totals.
Council Bluffs to Black Hills	520	$35,000	$18,200,000
Black Hills to South Pass	291	75,000	21,825,000
South Pass to Fort Bridger	131	50,000	6,550,000
Fort Bridger to Salt Lake	173	60,000	10,380,000
Timpanogos Canon	10	150,000	1,500,000
Salt Lake to Lassen's Meadows	451	45,000	20,295,000
Lassen's to Big Bend, Truckee	104	60,000	6,240,000
Big Bend to California State Line	38	66,000	2,500,000
State Line to Sacramento	140	88,428	12,380,000
Total	1,858		$99,870,000

The importance of this route to the great enterprise of which it is destined to form a link, cannot be more clearly manifested than in the reduction of cost in constructing the Pacific Railroad.

In all the previous comparisons of cost and distance, the Central Route has labored under great disadvantage, and has not taken the rank among routes, to which, by its merits, it was entitled.

A reduction in cost of $13,500,000, and a saving in distance of 184 miles of line, present features which may well invite consideration from the friends of that project.

GENERAL REMARKS.

It will be observed that the estimates of cost and distances from Big Bend of Truckee to Salt Lake are made upon the Beckwith or Humboldt route, a distance of 733 miles.

While it is possible that a more southerly line can be found along or near the Simpson route, in the absence of surveys, or data for estimate, no reliable opinion can be formed of its feasibility or probable cost.

Our line, at Big Bend of Truckee, is in position to join an extension on either route.

According to the itinerary of Captain Simpson, it does not appear that the more southerly route presents any advantage in distance to Salt Lake City.

The distance given by Captain Simpson from Carson City to Camp Floyd is 554 miles. Adding to this the distance from Sacramento to Carson City, 142 miles, and the distance from Camp Floyd to Salt Lake City—say 35 miles—it gives the total distance from Sacramento to Salt Lake City as 731 miles.

From our line at Big Bend of Truckee, *via* Simpson route to Salt Lake, the distance would be about the same as to Salt Lake City, on the Humboldt route, but should the main line of lower road be carried round the head of Utah Lake, and up the Timpanogos, it would make the lower line about 50 miles the shortest.

If a line can be found from the Sink of Humboldt across to Gravelly Ford (on that river,) it will shorten the Humboldt route about fifty miles.

There are three important considerations, however, which give the route up the Humboldt River a manifest advantage over any other route for a railroad line.

First—Its availability for a connection with Oregon and Washington.

Lassen's Meadows are only about eighty miles south of the forty-second parallel of latitude, which parallel is the southern boundary of Oregon, there being a good emigrant road from that point to Jacksonville and Fort Lane, in Oregon, the line following around the northerly end of Mud Lake, up Black Rock Creek, southerly end of Goose Lake, and between the Klamath Lakes to Jacksonville, from which point a good railroad line, with light grades, was found (see reports of Lieutenants WILLIAMSON and ABBOTT) to Portland on the Columbia River, the distance from Lassen's Meadows to Jacksonville being about 280 miles.

Second—The recent discoveries of silver on the Humboldt River in the vicinity of Lassen's Meadows.

The well known discoveries of silver ore in the Washoe Mountains has drawn thither, in the last two years, a population of about 17,000 souls, most of whom are hardy, able-bodied miners. Numerous flourishing towns and villages have sprung into existence, permanent improvements have been made, and but a few years will elapse before a new State will be formed out of that portion of Nevada Territory.

Within the last few months, discoveries of silver have been made on the Humboldt, which are said to rival those of Washoe. Already a new city is in existence, and hundreds of miners have gone there.

There will of course be but a small emigration there this winter; but next spring and summer will undoubtedly witness an influx of population hardly second to that of Washoe.

The mines are stated to be of great extent and richness, many of the out-croppings assaying over $1,000 per ton. A number of tons of ore have been sent to Sacramento and San Francisco for trial, the results of which have proved them to be of extraordinary richness.

Cinnabar and coal have also been discovered in this locality.

Several mills are in the course of erection, and permanent improvements are being rapidly made.

Being on the main emigrant route to California, and accessible from both Oregon and California, the accessions to its population cannot fail to be large; and it will not be many years before the new State of *Humboldt* will apply for admission into the Union.

Thirdly—From the feasibility of this as a Railroad route, and the character of soil, etc., along its route.

After striking the Humboldt at Lassen's, there are 190 miles of unobstructed valley, on which the grade for 145 miles is only four feet per mile; 36 miles are level; 24 miles has a grade of half a foot per mile; 160 miles has a grade of four feet; 50 miles has a grade of seven and eight feet; 53 miles a grade of eight and ten feet; 43 miles a grade of eighteen to twenty-one feet; 40 miles of from twenty-five to thirty-one feet: 18 miles of grade of fifty-eight feet; there being only eight miles of a higher grade, in eighty-nine feet, which can undoubtedly be reduced.

The elevation at Lassen's is only about 250 feet lower than the Big Bend of Truckee, the distance 104 miles.

There will be then 539 miles of light grades, not exceeding 31 feet per mile, on a line of 555 miles long—a feature of no little importance in determining the location of the Pacific Railroad.

The valley of the Humboldt has been traversed by many thousands of Emigrants to Oregon and California, and is well known to embrace many valleys of alluvial and fertile soil.

The general character of the soil in the great basin is barren and sterile, except where intersected by rivers. The valley of the Humboldt has received the largest share of the emigrant travel, for the reason that it afforded good grass, and water in abundance.

Being more inviting to emigrants, it will settle up more rapidly,

and thereby greatly facilitate the construction of a railroad line on this route.

Accompanying this report, will be found the following Maps, Profiles, etc.:

A. Large map on a scale of 400 feet per inch (90 feet long), showing the curves and tangents, from Dutch Flat to Truckee River, for filing in Secretary of State's office.

B. Seventeen sheets of location, numbered 1 to 17, inclusive, scale 400 feet per inch, showing curves and tangents, from Barmore's (or western base), to Dutch Flat, for filing, as above. (Also copies of same.

C. Five large maps (20 feet long), scale 400 feet per inch, showing curves and tangents, as follows:

No. 1. Barmore's to Clipper Gap.
No. 2. Clipper Gap to Dutch Flat.
No. 3. Dutch Flat to Rattlesnake Bluffs.
No. 4. Rattlesnake Bluffs to Summit.
No. 5. Summit to eastern terminus of survey.

D. Thirty-two sheets, numbered 1 to 32, scale 400 feet per inch, exhibiting the angular line as run with projected curves and tangents thereon.

E. Map (16 feet long) scale 5,000 feet per inch, exhibiting the country from San Francisco to terminus of survey, showing our line, with adjoining towns and rivers, for ten miles on either side, and connecting railroads,

F. Traced copy of the same.

G. Smaller map prepared for lithographing, showing whole country, from San Francisco to Big Bend of Truckee.

H. Britton and Rey's map of California.

I. United States Surveyor General's map of State.

J. Elliott's map of a portion of the State.

K. Ransom's map of San Francisco, and 40 miles round.

L. Map of Sacramento Valley Railroad, Sacramento to Folsom, scale 5,000.

M. Map of California Central Railroad, location, Folsom to Marysville.

N. Map of California Northern Railroad, Marysville to Oroville.

O. Map of survey, Sacramento to Benicia.

P. Map of survey, Marysville to Benicia.

Q. Map of survey, Folsom to Placerville.

R. Smith's map of survey for Canal up North Fork of American River to Lake Bigler.

S. Connected map of Lieutenant Beckwith's surveys, showing the topography, etc. from Benicia to Salt Lake.

T. Map of Captain Simpson's route to Camp Floyd.

U. Large map compiled in office of Secretary of War, showing the country west of the Mississippi River, with all the surveys for Pacific Railroad laid down thereon.

V. Smaller map of routes, as above.

W. Map of Rancho del Paso, through which our line passes.
X. Map of City of Sacramento.
Y. Map of survey across Sacramento Valley.
Z. Degroot's map of Washoe mines, also Pierce's map of Washoe.

PROFILES.

a. Sheets, 1 to 34 inclusive, working profile of line as run (horizontal scale, 400 feet; vertical scale, 30 feet per inch).
b. Profile of line to Dutch Flat (horizontal scale, 500 feet per inch; vertical scale, 50 feet per inch).
c. Two profiles of line reaching from Lincoln to Truckee River (horizontal scale, 1,000 feet; vertical scale, 100 feet per inch).
d. One profile, extending from Sacramento to Big Bend of Truckee, also showing a section of Washoe Mountains, on a line from Stout's to Fort Churchill (horizontal scale, 11,000 feet; vertical scale 600 feet per inch).
e. Copy of same for filing in Secretary of State's office.
f. Profile of Lieutenant Beckwith's line, Salt Lake to Fort Reading, containing profile of Noble's Pass.
g. Two sheets of profiles of various southern passes across Sierra Nevada (published in Secretary of War's office).
h. Barometric profile of reconnoisances in Sierra Nevada Mountains, viz.: Georgetown route; Dutch Flat Route; Henness Pass route *via* Nevada.

Also, a set of Pacific Railroad Reports, and all the maps, profiles, etc., relating thereto—published by United States Government.

Our levels indicate that many of the passes in the Sierra Nevada Mountains will be found, upon actual survey, much higher than they have been represented.

The estimates of business, and revenue of Road, will be deferred to another time in consequence of delay in procuring the statistics of the Washoe trade and business.

In conclusion, I take this opportunity of expressing my obligations to Messrs. Edward Judah, Assistant in charge of Party; John R. Brown, in charge of levels; H. T. Hall, Topographer; for the able and satisfactory manner in which they performed the arduous duties assigned them; also to Wm. S. Watson, Esq., Chief Engineer of California Northern Railroad, for valuable assistance in office; to Dr. D. W. Strong, of Dutch Flat, who accompanied me in my reconnoisance last fall, who was with me during the entire survey, and whose experience in and knowledge of the mountains was of the greatest assistance, and contributed to the success of the survey; also, to S. B. Wyman, Esq., of Virginia; Mr. Neil, of Neilsburgh;

Mr. Applegate, of Empire Mills; Messrs. Egbert and Brickell, of Illinoistown—who were with me on portions of the route; to Chas. Marsh, Esq., of Nevada, who accompanied me on the reconnoissance *via* Nevada and Henness Pass; also to Messrs. John Shaw, of Mormon Island, D. W. McKinney and Mr. Shankland, of Georgetown—who accompanied me on the Georgetown reconnoissance; also, to Mr. Stout, of Stout's Crossing, Nevada Territory; F. Moore, Esq., of Dutch Flat; and J. P. Robinson, Esq., of Sacramento, for courtesies extended.

Very respectfully,

THEODORE D. JUDAH,

Chief Engineer Central Pacific Railroad of California..

Oct 22nd 1862

ENGINEER'S OFFICE,
CENTRAL PACIFIC R. R. OF CALIFORNIA.

SACRAMENTO, October 22, 1862

TO THE PRESIDENT AND DIRECTORS OF THE CENTRAL PACIFIC RAILROAD COMPANY OF CALIFORNIA:

GENTLEMEN:

In accordance with a resolution of your board, passed October 9th, 1861, as follows:

"*Resolved*, That Mr. T. D. Judah, the Chief Engineer of this Company, proceed to Washington on the steamer of the 11th Oct. inst., as the accredited agent of the Central Pacific Railroad Company of California, for the purpose of procuring appropriations of land and U. S. Bonds from Government, to aid in the construction of this Road."

I beg leave to report my return to California after an absence of about ten months, having fully accomplished the objects of my

mission, a detailed and full account of which is herewith appended, marked document "A."

A brief statement of some of the advantages accruing to your Road through its connection with the Pacific Railroad bill, recently passed, seems necessary, in order to realize its advantages, and secure the benefits and public consideration to which it is justly entitled.

The theory of the Pacific Railroad bill recognizes existing Companies at either end of the Road; while the central division, or portion between the States of Kanzas and California, is committed to the supervision of a company created by Act of Congress, deriving its existing powers and authority from the bill itself.

Upon the eastern side, the right to construct the road, from the junction of the Missouri and Kanzas Rivers, through Kanzas, to the 100th meridian of longitude west from Greenwich, with all the grants, donations, etc., for about 350 miles, is given to the *Leavenworth, Pawnee, and Western Railroad Company of Kanzas.*

The central division, or portion through the Territories of Nebraska, Utah and Nevada, to the eastern boundary of California, a distance of about 1300 miles, is given to the *Union Pacific Railroad Company, a Corporation created by Act of Congress;* while the construction of the western division, reaching from the eastern boundary of California, to the navigable waters of the Sacramento River, or to the City of San Francisco, is assigned to the *Central Pacific Railroad Company of California,* to whom are made the grants of lands, bonds, etc., for that purpose.

The aid granted by the United States Government, to your Road, is liberal, and will materially assist in constructing and completing it.

ENUMERATION OF ADVANTAGES.

The first important advantage derived by your Road, consists in the grant of the free right of way to a strip of land 400 feet in width across all Government lands.

This is a liberal width, and *precludes the possibility* of building a parallel road over your route, at many points, without occupying a portion of your lands.

Secondly. The United States Government is obliged to *extinguish*

the Indian title to all lands donated to the Company, either for right of way, or to the land granted on either side of your road.

Thirdly. In order to prevent speculation by individuals, who may enter upon and take up these lands, *after* the passage of the Railroad bill, and *before the Company has time to locate its line with accuracy*, it is provided "that within two years after the passage of this act, said Company shall *designate* the general route of its road, as near *as may be*, and file a map of the same in the Department of the Interior, whereupon the Secretary of the Interior shall cause the lands within fifteen miles of said *designated* route, or routes, to be *withdrawn* from pre-emption, private entry and sale; and when any portion of said route shall be finally located, the Secretary of the Interior shall cause the lands hereinbefore granted, to be surveyed, and set off, as fast as may be necessary, for the purposes herein named."

Before leaving Washington, I made a proper map, showing the general route of our road, in accordance with the provision of the bill, which map, accompanied by a written designation of the route, I filed with the Secretary of the Interior, who assured me that he would give the necessary instruction to have the same withdrawn from market. *This has been done. Such lands are now secured to us*, and cannot be pre-empted or purchased, until after our final location, and until a survey by the United States authorities of these lands.

The Department of the Interior also expressed a desire to co-operate with our Company *in preventing the cutting of timber on these lands.* It becomes, therefore, important for your board to decide, if they will take any steps to prevent depredations upon these timbered lands, until a final location is made of the whole, or a part of their road.

Fourth. A grant of United States Bonds, to the amount of about $6,000,000 is made to this Company. These bonds run for 30 years, draw interest at the rate of six per cent., payable semi-annually, by United States Government, *who cannot redeem them until their expiration*, or, for, say, 30 years, as is the case with their issue of 20 year bonds, which are redeemable, after five years, at the option of the Government.

They are, therefore, the best class of Government bonds in market, and will lead all others of her securities, now issued.

These bonds enure to your Company, as *each section of* 40 *miles*

is completed, west of the western base of the Sierra Nevada mountains, at the rate of $16,000 per mile,—while for 150 miles from such western base easterly, the amount *is increased to* $48,000 *per mile,* and the same are paid over as *each section of* 20 *miles is completed.*

Your road exhibits a remarkably favorable peculiarity in this respect.

While most of the Railroads constructed in the United States, are encumbered with issues of mortgage bonds, *on which the yearly interest must be paid, as well as the bond itself at maturity,* usually taking, for that purpose, the earnings of the road, which otherwise would be applied to the payment of dividends to stockholders.

Your Road, *instead of issuing her own bonds,* for the payment of which, and the interest, she would have to provide, *receives all the benefits of nearly* $50,000 *per mile, or an aggregate of* $6,000,000, *of United States bonds,* the interest on which is regularly paid by the Government, until their maturity. It is true that Government contemplates the repayment of this loan at that time, but it is obvious that Government will furnish very nearly business enough to the road, to repay them before the bonds become due. Therefore, instead of appropriating the net earnings of your road yearly, to the payment of interest on bonds, *there is no reason why such earnings* should not go to the stockholders in the shape of dividends.

This feature, peculiar to your road, is deserving of especial consideration. These bonds will, probably, command a premium in market, and, whenever our present difficulties are settled, will be sought after *in preference to all other issues, for foreign investment.*

Fifth. The *right to extend the road* from Sacramento to San Francisco, is given to your company, with all rights, grants, donations, etc., given to that portion of the line, west of the western base of the Sierra Nevada.

Sixth. Perhaps the most important feature in the grant, made to this Company, exists in authorization, or *right given it to continue on from the easterly line of the State of California eastwardly,* and construct the line of Pacific Railroad and Telegraph, until it meets and connects with the line of the Union Pacific Railroad and Telegraph, coming from the east.

This virtually concedes to your Company the right to construct at least one half of the line of the Pacific Railroad, and to receive all the grants, donations, etc., therefor, without absolutely compelling them so to do.

It becomes important, therefore, that a Railroad survey be made from the eastern boundary of the State eastwardly, to, say, Salt Lake, for the purpose of determining the cost of a Railroad line, and to ascertain if sufficient inducement exists for your Company to construct said road. I am positive in the opinion, that it will be found advisable *to undertake the construction of about* 300 *miles next easterly from the State line of California.*

VALUE OF LAND GRANTS.

The United States Government donates to your Company every section of land (not sold, pre-empted, or otherwise disposed of), for a distance of ten miles upon either side of the road. Mineral lands are excepted from the operation of the Act, but wherever the same contains timber, the timber thereon is granted to the Railroad Company.

The quantity of land, (if it were all available to the Company), would be 6,400 acres per mile, or about 960,000 acres between Sacramento and the eastern boundary of the State. From the western base of the Sierra Nevada to State line, nearly all of these lands are covered with timber, which becomes valuable as soon as a railroad is built, on which it can be transported to market.

It is always difficult to estimate the worth of timber lands, their value being dependent upon their quality, the density of the timber, the demand for, and facilities for conveying it to market.

The Saratoga and Sackett's Harbor Railroad Company, of the State of New York, who have 500,000 acres of timber land in that State, in a report published by them, estimate the avails of its yield as follows:

ESTIMATED TIMBER VALUE OF LANDS BELONGING TO THE SARATOGA AND SACKETTS HARBOR RAILROAD.

Products.	Quantity.	Retail Price at Tide water	Total value at Tide water	Corded on Line of Road.	Freight on their Railroad.	On other Connecting Roads	Nett Proceeds
Wood	30 Cords	$ 5 00	$150 00	$ 30 00	$ 75 00	$ 15 00	$ 30 00
Spars	1 128-1000	150 00	192 00	16 67	16 67	3 33	162 00
Hemlock Bark	5 Cords	7 00	35 00	12 50	12 50	2 50	15 00
Pine Lumber	2,280 Feet	22 00	50 16	5 70	5 70	1 14	31 92
Sprnce	13,680 Feet	10 00	136 80	34 20	34 20	6 84	27 36
Maple	6,840 Feet	15 00	102 60	17 10	17 10	3 42	47 88
Total.			$666 56	$159 00	$161 17	$ 32 23	$314 16

Thus it will be seen that they estimate their spar timber at 1 $\frac{128}{1000}$ spars per acre, as yielding a nett profit to them of $162 per acre or a total of $81,000,000.

The whole nett proceeds of the production of their lands, they estimate at $341 per acre, or an aggregate in round numbers of $157,000,000. Their lands they assume to be worth $15 per acre, afterwards, or $7,500,000.

They estimate the freights derived from one acre of timber land and accruing to the Railroad Company, to be $161 17, which on their 500,000 acres amounts to $80,585,000. They also make the statement, based upon the production of a good farm on the Illinois Central Railroad as a guide, that there is more freight on their landed estate now ready for the cars, than can be produced from the original and entire estate of the Illinois Central Railroad Company in more than one half a century.

They also state, that a committee of capitalists, proposing to become interested in this work, personally traversed the route of their Road, and made a report thereon, from which the following extracts were taken. They say: "The Engineer states, and your Committee confirm his statements, from personal observation, that this Road for more than seventy-five miles, passes directly through a wilderness, as remarkable for its density and extent, as any other in this country.

"The land for ten miles on each side of the road, and for ten miles from the margin of the lakes, is groaning under the weight of an immense amount of most valuable freight, all of which is wanted at tide-water as speedily as it will be in the power of the Road to transport it. There is more freight on the surface now ready for use, than could be grown upon a cultivated country in more than half a century. The weight of lumber, etc., is about seventy tons per acre. The average weight of products of an agricultural country does not much exceed one ton per annum per acre."

Thus are the products of a timber domain estimated, *when railroad facilities are afforded* with which to carry its products to market.

It is not expected that the timber land belonging to your Company will prove as profitable as that estimated by the New York Company, *nor is this estimate here introduced to promulgate such an*

idea, but for the purpose of illustrating the *difference in value* between a timber estate *without*, and one *with* facilities for conveying the same to market. While this is the case, the fact cannot be controverted that your Company possesses about 500,000 acres of timber land, which will, by the construction of your road through it, become immediately available and largely enhanced in value; and if we allow that 300,000 acres, or one-third of this land, contains *only ten trees per acre*, from which can be cut six logs twelve feet long per tree, averaging twenty-four inches square, this gives 3,400 feet, b. m., per tree, and the total quantity amounts to ten thousand millions feet of lumber, which delivered at Sacramento at, say $15 per thousand, amounts to one hundred and fifty millions of dollars; or calling this lumber worth, standing, one dollar per thousand, it would be worth $10,000,000 to the Company.

It is well known that the sugar pine of these lands often runs 125 feet high without a limb, and often measures eight feet through at base—while a tree is seldom found measuring less than three and one-half feet at base. Cut but one tree per acre per year, and it gives an annual yield of 1,000 million feet of lumber—three million feet per day, equal to 5,000 tons per day, or, say, 1,750,000 tons per year.

Allowing the 500,000 acres instead, to yield fifty cords of wood per acre (a very low estimate) and it amounts to twenty-five million cords of wood, which, if delivered at Sacramento at $6 per cord, would amount to 150 millions of dollars, and pay the road about 100 millions of dollars freight.

It is well known that the supply of wood is becoming more scanty, and is rising in value yearly.

What then may we estimate the value of this domain in years to come, not only to the Company, as owners, but to the railroad as a source of revenue in its transportation, and to the community, who are obliged to use it.

Wood is now worth $18 per cord in Washoe, and in the winter commands $40 per cord. In fact, the cost of hauling is so great that not a few mills have been compelled to stop work, and are now idle in consequence.

How difficult it is then to realize the immense value of this estate, which belongs to your Company, *by absolute grant from the United States Government*, and to which you hold as title, which *cannot be disputed or disturbed*.

REVENUE.

In estimating the revenue of your road, it is gratifying to be able to arrive so correctly at its probable business from statistics of actual business, now performed over the same route, exclusively by freight teams and stages.

It may be truly said, that no road was ever constructed or contemplated in the United States, or elsewhere, that promised as large and speedy a return upon investment, as the one proposed to be constructed by you between the city of Sacramento and the Washoe silver mining district.

The extent of the existing trade now performed over this route by teams and stages, can be scarcely realized, except upon careful inquiry and investigation. It is difficult to credit the statement that *over five millions of dollars per year is paid out for freight alone to Washoe*, but rigid scrutiny and investigation bears out the assertion, which seems to be entirely within bounds—and this trade is increasing and growing every day.

Your road, when *completed*, from Sacramento to Washoe, will perform—

1st. The local business of Placer, Nevada, Sierra, Plumas, and a portion of that of El Dorado county.

2d. Over its first 25 miles, the northern business, now performed by stages and steamboats.

3d. The entire freighting and passenger business of Washoe, Esmeralda, Carson Valley, Pyramid Lake and Humboldt, and a portion of the Salt Lake business.

It is to be observed that the freighting business to the mountains and to Washoe is now performed entirely by teams; there is no other way of forwarding goods to the interior.

The lowest price paid for freighting to Washoe is four cents per pound, or $80 per ton, and that only when the roads are in good condition.

When the roads are not in good condition, or when there is a large amount of freight offering, this price is increased to six, eight and ten cents per pound.

A peculiarity of Washoe is, that it is situated in a section of country so barren and sterile that nothing but a scanty supply of vegetables can be raised there. Every thing used there to eat or

wear, all neeessaries of life, as well as all manufactured goods, have to be transported by wagons or mules. The inhabitants, therefore, are absolutely compelled to draw their supplies of all kinds from the western side of the Sierra Nevada Mountains, and in paying for their supplies, to pay the additional eost of freighting by wagons, at from four to ten cents per pound.

This is the business proposed to be performed by your Railroad, when constructed, and it is obvious that it will be entirely eommanded by your Road without competition. With a Railroad built to Washoe, this business eannot be performed by any other means, or in any other manner.

In addition to this large and inereasing business, may be reckoned that of supplying lumber, timber, and logs for eonsumption and for timbering the mines; also, fuel for consumption in the eities of Nevada Territory, and to supply the mills, a majority of whieh are run by steam.

As has been previously observed, wood is worth at the present time $18 per eord, and in the winter will be worth $40 to $50 per eord, and many of the mills are obliged to eease running in eonsequenee.

Your railroad will supply this fuel from the timber on its own lands, and at sueh a reduction in priee *as will enable these mills to run through the entire year.* It is a faet worthy of observation, that the eonstruction of this road will *save to the residents of Washoe and Nevada Territory, over* $2,500,000 *yearly.*

In order to obtain accurate information with regard to the businees now performed over what is known as the Placerville road to Washoe, I have stationed a trustworthy and reliable agent at Strawberry Valley, (J. R. Atkins, Esq.,) who has taken a eareful and eorrect aeeount of the travel passing that point for eight weeks, commeneing August 16, 1862, and terminating October 10, 1862, or for a period of fifty-six days.

Every team going and returning was eounted eaeh day, and Mr. Atkins' returns present a eomplete statement of the weight and nature of eaeh load, the number of horses, mules or oxen, of stages and stage passengers, buggies and oeeupants, riders, footmen and loose stoek.

It is to be borne in mind that these are the returns on only one road to Washoe; the different roads are enumerated as follows:

Big Tree Road.
Amador Road (new road).
Placerville Road.
Henness Pass Road.

Which comprises the Nevada road, the Marysville, San Juan and Downieville roads, and the Sierra Valley and Beckworth's Pass road.

A compilation of these returns is herewith presented:

ACTUAL COUNT OF TRAVEL ON THE PLACERVILLE WAGON ROAD TO WASHOE AND NEVADA TERRITORY FOR EIGHT WEEKS, ENDING OCTOBER 10, 1862.

Number of Stages bound up	169
Number of Stages bound down	171
Number of Buggies bound up	61
Number of Buggies bound down	46
Number of Stage Passengers up	1,287
Number of Stage Passengers down	785
Number of Travelers, other than Stage passengers, up—riders, footmen and in buggies, (~~including emigrants~~)	1,288
Number of Travelers, etc., down (~~including emigrants~~)	2,508
Loose stock, of all kinds, up	573
Loose stock of all kinds, down	434
Number of Teams bound up	4,142
Number of teams bound down	4,464
Number of Animals in teams, up	22,728
Number of Animals in teams, down	22,803
Number of pounds of Freight, up	19,386,200
Number of pounds of Freight, down	

Teamsters are not included in the above return.

RECAPITULATION.

	FOR EIGHT WEEKS.			FOR ONE DAY.		
	UP.	DOWN.	TOTAL.	UP.	DOWN.	TOTAL.
No. of Stages	169	171	340	3	3	6
No. of Buggies	61	46	107	1	1	2
No. of Stage Passengers	1,287	785	2,072	23	14	37
No. Travelers, Footmen, and in Buggies	1,287	2,508	3,796	23	45	68
No. loose stock, all kinds	573	434	1,007	10	8	18
No. of Teams	4,142	4,464	8,606	74	80	154
No. of animals in teams.	22,788	22,003	45,591	407	407	814
No. pounds of Freight	19,286,200		20,000,000	346,185		357,000
No. tons of 2,000 lbs	9,683		10,000	173		178

From which it appears that the daily average of loaded teams bound up is..... 74
The number of tons of freight transported daily up is..... 178
The number of stage passengers both ways is..... 37
The total number of travelers, including stage passengers..... 105

Allowing 18 days as the average time of a trip, and the number of teams and teamsters employed, amounts to 2,772, and of animals, 14,652.

At the present date, Oct. 22, 1862, the price of freight is seven to eight cents per pound.

Estimating the yearly average of freight over the Placerville road to be 120 *tons per day*, at an average price of *six cents per pound, and the total amount paid for freight alone, amounts to* $5,256,000 upon this one road.

A four horse or mule team, which makes the trip in about sixteen days, pays for tolls $22 75; a six horse or mule team pays $30 tolls. Averaging the time at eighteen days, the tolls at $25 per trip, and we find that the enormous sum of $693,000 per year year is paid for tolls by freight teams.

The returns show that the stages average 37 passengers per day, which, at $30 per passenger, amounts to $405,150. It is believed, however, that the total receipts of the stage line exceeds this sum.

It will be observed that 68 additional travelers per day, or nearly double the number carried by stage, pass over this road, at least one half of whom would probably take the cars, were a Railroad completed.

From an entirely reliable source, I have ascertained that the total amount of silver bullion brought down by Wells, Fargo's Express, for the ten months of 1862, is over 150,000 pounds, and may be safely stated at 200,000 pounds for the entire year.

Its value is not, of course, known, gold being mixed with it, but it is safe to estimate it at $30 per pound, or a total value of $6,000,000.

This is only what comes by Express, and does not indicate the amount actually taken out, and retained there, or sent down by private conveyance.

It is estimated by Wells, Fargo & Co., that this amount will be doubled for the year 1863, and in 1866, reach twenty-five millions of dollars.

It would, perhaps, be proper, therefore, to assume that, upon

the completion of your road, at a charge of one per cent., an additional revenue of at least $200,000 per year would be derived from this source.

ESTIMATED ANNUAL RECEIPTS OF ROAD IN CALIFORNIA.

PASSENGERS IN CALIFORNIA.

10 Ranch passengers, per day, each way.
10 Lincoln " " "
30 Placer Co. " " "
30 Nevada Co. " " "
40 Marysville and North " "

120 total, each way.
240 total both ways, or

75,120 yearly Lincoln passengers @ $2	$150,240
10,000 way passengers beyond @ $5	50,000
Gives as total receipts from passengers	$200,240

FREIGHT IN CALIFORNIA.

25 tons ranch freight.
20 tons Lincoln freight.
50 tons Placer County freight.
75 tons Nevada County freight.
75 tons Marysville and North freight.

245 tons freight per day.

82,000 tons per year, to Lincoln, @ $2 50	$210,000
22,000 tons per year, to points beyond, @ $5	110,000
25,000 tons return freight, cobble and stone, @ $1	25,000
50,000 cords wood, @ $2	100,000
18,250 M feet of Lumber, @ $5	91,250
Total receipts from freight,	$536,250
Add Passengers,	200,240
Gives as total receipts,	$736,490

ESTIMATE OF ANNUAL RECEIPTS FROM WASHOE BUSINESS.

On 160 miles of Railroad completed from Sacramento to Stone's Crossing of Truckee River, or Virginia Station, from statistics of Placerville Route as a basis.

WASHOE BUSINESS.

43,800 tons up freight, @ 2 cents per pound,	$1,752,000
30,000 tons down freight, @ 1 cent per pound	600,000
25,550 passengers, @ $15	383,250
50,000 cords wood, @ $5	250,000
18,250 M feet Lumber, @ $10	182,500
Express, Mails, etc.,	50,000
Total receipts, as per statistics of Placerville road,	$3,217,750
Add 25 per cent. from passengers and freight from otherwards,	700,000
Total receipts of Washoe business,	$3,917,750
Add receipts for local California trade,	736,490
Gives as total receipts of road	$4,654,240
Deduct all expenses of operating road, repairs, taxes, etc.	1,000,000
Leaves, as net revenue,	$3,654 240

Which is equivalent to an annual net profit of 25 per cent. upon a cost of fifteen millions of dollars, or monthly returns of two per cent. per month.

Upon completing the first division of fifty miles, your road will perform, in addition to the local business of Placer, Nevada, Sierra and Plumas counties, and the Marysville and northern business, a *greater portion of the present Washoe business* over such division of fifty miles.

In addition, therefore, to the estimated receipts from California business, it will be proper to add as follows:

WASHOE BUSINESS ON FIRST FIFTY MILES.

30,000 tons freight, @ $5	$150,000
15,000 passengers, @ $3	45,000
Mails and express	15,000
Total	$210,000

Add total California receipts, less $80,000, estimated for points beyond Lincoln.....$656,490

Gives as total receipts, fifty miles.....$866,490
Deduct all expenses, operating, etc..... 150,000

Gives as net profits.....$716,490

Or an annual net profit of twenty-four per cent., or monthly return of two per cent. per month.

That these results appear large is true, but it is no less true that the conditions which produce these results are extraordinary, and *unlike* those which govern the business conditions of any other Railroad ever built, with one exception, viz: the Panama road.

The charge for transporting a ton of freight over a Railroad 160 miles long in the Atlantic States, would be from four to five dollars—say five dollars.

As has been previously observed, the *lowest* rates for freight over the line of your road by wagons, are $80 per ton; while the average cost by wagon is over $100 per ton.

A reduction in price to $40 per ton by Railroad, and a saving in time from nine days to one day, would give satisfaction to both merchants and consumers, and secure every pound of Washoe freight over your road. The receipts being at least eight times those of a Railroad in the Atlantic States performing the same business—while the expenses of operating your road will not be in the same proportion.

Statistics of Railroad operations, show the cost of fuel to be a prominent item in the cost of operating Railroads, and this feature is nowhere more clearly shown than in a comparison of the difference in cost of operating the Baltimore and Ohio Railroad, and the New York Central Railroad, to roads of about equal length. The first named road using coal procured from the line of their road at cheap cost, while the latter is compelled to supply itself with fuel at what may be considered a high price.

The cost of fuel upon the line of your road will be simply the cost of cutting it, which can be contracted for to any extent at not over one dollar per cord—and the supply may be considered, for all practicable purposes of your road, as inexhaustible. It is to be remembered, however, that the supply of fuel for operating the Pacific Railroad as far east as Salt Lake, will have to come from the

Sierra Nevadas, and in all probability from your lands. It is a source of congratulation, therefore, that you are so liberally provided with that article most needed in the future, and in fact absolutely essential in conducting the future operations of the road with economy.

It has been stated that the cost of operating roads, having heavy grades and high summits, is greater than upon valley roads, and that this argument applies to your road. This is, in a measure, true; but an analysis which resolves the elements of this increased cost, will prove that it is mainly owing to the necessity of employing *greater locomotive power* with which to overcome these grades and summits, equivalent to the use of *more steam*, or, in other words, *more fuel*. Therefore, it may be fairly stated, and can scarcely be denied, that this objection does not apply with its usual force to your road.

RETURN FREIGHTS OF SILVER ORE.

Without entering into the details of this subject, it may perhaps be sufficient to say that the business of carrying return freights of low grades of silver ore for foreign shipment at San Francisco, can be made a profitable business to the road.

The following extract is taken from the communication of a firm in San Francisco (date of November 4, 1860, or a year ago,) who were conversant with that branch of business, and who were at the time supplied with foreign capital for this very purpose. They say:

"There are now, probably, forty to fifty mining claims being worked, from which not less than two hundred tons of ore are being taken out daily, that would warrant shipment at a low rate. There are four first class mines, viz: the Ophir, Mexican, Central, and Gould and Curry, that alone are capable of turning out that quantity of ore, of sufficient value to warrant transportation by Railroad to this place for shipment.

It is only necessary to furnish facilities for cheap transportation, to insure the opening and working of hundreds of rich claims, capable of turning out an almost incredible quantity of ore, every ton of which would meet with ready sale on its delivery at either terminus of the road. It is a safe calculation to estimate that five hundred tons of ore daily, would be sent over such a road, at a rate of freight not exceeding say $25 per ton. In fact, the only limit to the quantity would, perhaps, be the inability of the road to do the business offered.

There are, at the present time, a number of agencies of eastern and foreign capital, armed with authority and means to purchase, at remunerative prices to the producer, ores of any grade, from $100 per ton and upward; but, owing to the limited quantity arriving, have not been able to purchase a fraction of the orders in hand. It is difficult to say what would be the limit to the amount of capital seeking investment in this channel. It is safe to say that five thousand tons of ore could be sold for cash, at this moment, if it could be had.

In regard to the benefit to the State and cities of California, that would arise from the enterprise proposed by you, it is almost impossible to calculate its extent. That it would make it the richest and most prosperous State in the Union, there is not a doubt. This new resource of wealth is unbounded, and the only obstacle to its realization, is that which your project will most certainly remove."

The capacity of your road for the performance of a business of this kind, may be estimated by a comparison with that of similar roads.

The Mine Hill and Schuylkill Haven Railroad of Pennsylvania, possesses grades of two hundred and fifty feet per mile. The tonnage of coal over this road, which (it is to be borne in mind) is one way, was as follows:

For 1855	1,534,876
For 1856	1,614,887
For 1857	1,564,119
For 1858	1,452,083

Or an average of about five hundred tons per day.

DESCENDING GRADES FOR RETURN FREIGHT.

It will be remembered upon your road the up grades are principally ascending eastwardly, while the return loads are carried mostly on down grades. Its capacity, then, for return business, is not to be judged by the character of its ascending grades.

Trusting that the above report may serve to explain the permanent features of this enterprise, and soliciting your indulgence towards any imperfections or omissions it may contain, arising from want of time and unavoidable interruptions,

I am, very respectfully,

THEODORE D. JUDAH;

Chief Engineer C. P. R. R. Co. of California.

No 4

(4)

REPORT

OF ~~THE~~ J D Ludah

CHIEF ENGINEER

and Agent of

OF THE

Central Pacific Railroad

COMPANY OF CALIFORNIA,

ON HIS

OPERATIONS IN THE ATLANTIC STATES.

From October 10th 1861
August 17th to 1862

SACRAMENTO:
H. S. CROCKER & CO.'S PRINT, 107 J STREET.
1862.

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Judah, Theodore D

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REPORT.

SACRAMENTO, September 1, 1862.

To the President and Directors of the Central Pacific Railroad Company of California:

GENTLEMEN—In compliance with a resolution of the Board of Directors, a copy of which, marked A, is herewith appended, passed October 9, 1861, appointing me as accredited Agent and Chief Engineer, with instructions to proceed to Washington to further the interests of this company there, in obtaining Congressional grants, appropriations, etc.

I collected together all the maps, profiles, field notes, etc., of our recent survey, and sailed for the Atlantic States on steamer of October 10, 1861.

Our Congressional Representative, Mr. Sargent, being a fellow-passenger, a good opportunity was afforded for explaining many features of our project not easily understood, without more than a cursory examination, which explanations were of great service to us in future operations.

The trip also afforded an opportunity to write a portion of the report of our recent survey, which being subsequently completed in the City of New York, I procured one thousand copies to be printed, distributing a portion of the same among railroad men, where likely to do us most good, sending copies to President Lincoln, the heads of Departments, and to our Senators and Represen-

tatives in Congress. It was also published in the railroad journals, and thereby obtained considerable circulation before the meeting of Congress.

Meeting in New York our Senator, Hon. Jas. A. McDougall, Chairman of Senate Pacific Railroad Committee, after a long and exceedingly satisfactory interview, I left fully satisfied that in him the Pacific Railroad had a firm friend, not likely to be discouraged by the threatening aspect of our affairs, but ready and anxious to adopt the plan best calculated to make the Pacific Railroad a success in the present session of Congress, and to urge the same to speedy termination.

Mr. McDougall requested me to arrive at Washington at least a week before the meeting of Congress, to assist him in preparing a bill, so as to have it ready to introduce at an early day.

I accordingly proceeded to Washington on the 20th, and lost no time in calling upon both our Senators.

Senator McDougall saw in the present position and temper of Congress a favorable time to press the subject of Pacific Railroad, and accordingly determined to report a bill from his Committee at an early day. At his request, I prepared a bill similar in its general features to the Curtis bill, embodying improvements and ideas suggested by himself, and also incorporating some ideas suggested by others, his intention being to lose no time in introducing this bill. But upon mature reflection and consultation, it was thought advisable to await the action of the House, and try to maintain an uniformity and concert of action.

Upon Mr. Sargent's arrival in Washington, there was yet undisposed of a vacancy in Pacific Railroad Committee, and also on Indian Affairs. The Speaker assigned Mr. Sargent to the Pacific Railroad Committee, and to no other, so that what then seemed almost like an act of hardship, in assigning a new member to *no* standing committee, but placing him on a special committee which had for many years been unsuccessful in their labors, in reality proved an act of great benefit to our future interests, as well as to the State of California; for Mr. Sargent, having no other committee duties to occupy his attention, took hold of the Pacific Railroad and devoted his time and energies almost exclusively to that subject.

Mr. Sargent, in the early part of the session, prepared a bill which was introduced into the House, and referred to the Pacific

Railroad Committee of the House, but for nearly two months it seemed almost impossible to awaken any interest in the subject until the latter part of January.

Determined to arouse the attention of the House, and endeavoring to procure, if possible, some action on the subject, Congress being in Committee of the Whole on the state of the Union, Mr. Sargent obtained the floor and delivered his first speech on the subject of Pacific Railroad, instead of on the prevailing topic of the day. Being rather inappropriate to the business then before the House, it occasioned some surprise, but the arguments it contained were so well taken and so forcibly put, as to arouse attention to the subject, and thereby accomplishing the expected result.

A meeting of the House Pacific Railroad Committee was almost immediately called, at which they decided to report, favorably, a bill forthwith. Mr. Sergeant offered a resolution in committee, appointing a sub-committee to prepare a bill, which passed, the Chairman appointing Messrs. Campbell, Sargent, Franchot and Shield, on such committee. Up to this time several bills had been introduced in the House, but they, with one exception, were all framed upon the theory of the Curtis bill in regard to the construction of road at the ends, creating but one company, and giving to them the whole road from the Missouri river to the Pacific ocean. The only exception to this was a bill (afterwards known as the Rollins bill), introduced by Mr. Rollins in the House, and by Mr. Pomeroy in the Senate, giving the eastern end to a Kansas company, and the western end, in California, to our company; and strange as it may seem, although differing in that respect from any other bill ever before offered, yet the theory of this bill seemed to be regarded quite favorably. The work of preparing a bill for the sub-committee having fallen upon Mr. Sargent, upon thorough examination and consultation with the friends of the Pacific Railroad, he decided to favor the plan of the Rollins bill, as obviously the most desirable, and frame a bill giving the ends to companies as therein contemplated. The original Rollins bill was imperfect in many particulars; as for instance, it provided that for two hundred and fifty miles from the foot of Rocky Mountains westerly, and two hundred and fifty miles from the California State line eastwardly, the appropriations should be *doubled*, or $32,000 per mile; which would give an increased appropriation on our side, east of the Sierra Nevadas, *exactly where it was not wanted*.. We wanted it across the Sierra

Nevada Mountains, while this bill gave it only after they were crossed. This was altered, making the appropriation *treble* instead of double, for one hundred and fifty miles from the west base of Sierra Nevada eastwardly, and from the east base of the Rocky Mountains westwardly, while on all the intermediate intervening space, the appropriation was *doubled*. That bill also gave any other company in California the right to unite with our road, and become participants in benefits, appropriations, etc., of the bill. This clause was also removed.

The Nevada company, of Nevada Territory, not mentioned in the Rollins bill, was also recognized in the new bill, and the grants through that Territory given to that company.

Various other modifications and improvements were made, and the bill presented to sub-committee by Mr. Sargent. It received their sanction, was reported to their main committee, and received the general approval of that committee.

In the meantime Gen. McDougall had called several meetings of his committee, who had before it all the several bills introduced, and among them the Rollins bill, introduced by Mr. Pomeroy, and here, as to structure, this bill seemed to meet with most favor.

Being made aware, from day to day, of the action of the House committee, and becoming convinced of the necessity of harmony of action between Senate and House on the bill, Gen. McDougall determined to await the action of the House committees, and if they adopted a bill, which both committees could agree upon, to report the same bill to the Senate.

Immediately upon learning of the result of the action of the House sub-committee, he called his committee together, and they decided to adopt the House sub-committee's bill, which was done, and (on February 25, 1862), it was reported to the Senate for leave to print, and recommitted to the Senate Pacific Railroad Committee before being reported by the main House Pacific Railroad Committee to the House.

A few days afterward (March 4, 1862), the House committe reported this bill to the House, which was printed, and referred back to the committee.

It is not to be thought that all these matters were being accomplished without opposition; they were done in the face of decided opposition and determined hostility from various parties, whose

interests were antagonistic to our own, and who fought the bill with energy to the end.

You will observe that much had now been accomplished, notwithstanding the fact that all other bills, at all other sessions of Congress were framed upon the principle of recognizing but one company to build the entire road, which principle seemed to have been settled upon by general consent, as evidenced by the discussions and vote upon the Curtis bill in the two previous sessions of Congress. Yet this was a bill recognizing the employment of companies already existing at either end, and making the appropriations direct to them for the construction of the road through their respective States, one of them being our own company. The Maine, or Perham Company, who have had bills before Congress at every session for the last six years, and who had their bill before both branches of Congress at this session of Congress, were entirely ignored, though appropriations increased throughout the whole bill, and *double* the amounts contemplated in the Curtis bill, given to us, through the State of California to the Big Bend of Truckee. The right given us to build the *entire line* in California, either from the Sacramento river or from San Francisco; the Nevada company recognized, and $32,000 per mile, with 6,400 acres of land per mile given for that portion of the road; the lengths of sections across the Sierra Nevadas reduced from forty to twenty miles; two years given us in which to build the first fifty miles, and only fifty miles per year required thereafter. And this bill approved and reported by both House and Senate committees at the same time—this was the first time that both Pacific Railroad Committees of Congress ever reported in unison the same bill, and at the time this was done, the Chairmen of the two committees had not met, or had any consultation on the subject.

A brief explanation may suffice to show how this was done. The principles which produced this result were control and *harmony*.

The control of Senate committee rested with the chairman, Gen. McDougall, while the stirring speech and judicious after action of Mr. Sargent gave him virtually the control of the House committee, although not its Chairman. On Mr. McDougall, as Chairman, rested the responsibility of preparing such a bill as would receive the sanction of his committee, while upon the House side that

power was given to a sub-committee, and by that sub-committee delegated to Mr. Sargent.

I may here mention that I had been appointed Secretary of the Senate Pacific Railroad Committee, having charge of all their papers, etc., being present at their meetings, and having the privilege of the floor of Senate, while upon motion of Mr. Sargent, I was appointed Clerk of the House sub-committee, who held their meetings in our committee room, had the privilege of the floor of the House, and I afterwards acted as Clerk of the main House committee.

At the time of first meeting of the House committee, a number of bills had been introduced into the House and Senate, and it soon became evident that unless some *unanimity of action* were had, that no Pacific Railroad bill would pass the present session of Congress.

With a view of harmonizing and combining the strength of the three most prominent interests, the Rollins bill was framed, taking in and making the whole of these grants to the three companies; the eastern end being given to the Pawnee, Leavenworth and Western Railroad, the central portion to the Perham Company, and the western end to our company. This was the first move under *the* principle of harmonized action. As it combined three of the most active influences, it was a preliminary step in the right direction.

The whole matter being now in the hands of the sub-committee, and by them delegated to Mr. Sargent, the following important alteration was first made. The name of the Peoples' Pacific Railroad, or Perham Company, was left out entirely, leaving the central section or division open to corporators, as in the Curtis bill, and leaving the ends as first arranged, for the following reasons:

Upon investigation it was satisfactorily ascertained, that the Perham Company had not the strength or influence they claimed. The managers of their affairs claimed so much for their company, and made such pretentious demands that it became necessary to make an investigation as to their responsibility and standing, the result of which was decidedly against the policy of retaining them in the bill. Again, it was evident that one of the strongest features of the Curtis bill, was in the provision making grants to corporators named in the bill, as the list comprehended prominent railroad men and capitalists from all the principal lines of road in the

United States. Their names being given in by delegations from the various States, of course interested members of those delegations in favor of the bill, and combined a strength and influence which could not otherwise be had. The absence of this feature in the Rollins bill, was the absence of great strength, and after weighing the anticipated opposition of the Perham Company against the increased strength of the bill, with this feature restored, Mr. Sargent, sustained by my advice and the results of his inquiries with regard to that company, decided to throw them out, believing that the bill could not otherwise be passed, and the final result proved the correctness of these conclusions.

When this became known to the Perham Company, as a matter of course their fierce opposition was encountered, and a determined and bitter warfare kept up, not only against our company, but finally against the bill itself. Pamphlets were written and laid on the desks of members and Senators, absurd statements with regard to bribery, fraud, etc., were freely circulated, and every effort made to poison and prejudice the minds of members against the bill, but as it appears, all in vain.

This bill emanated from Mr. Sargent's hands. Shorn of its excresences, the appropriations were increased, where an increase was wanted, the sections reduced to twenty miles in the mountains, the Nevada company recognized, the right of other companies in California to join without our consent, stricken out, the width of right of way made four hundred feet. Provision was made for an Iowa branch to reconcile that interest; the bonds and interest were to be repaid entirely in transportation and service for the Government, and no per centage deducted.

The wording of the bill was very similar to that of the Curtis bill. Room was left for the corporators to build about one thousand miles. Nearly the whole of the sections and provisions of the bill related to the Central or Union Pacific Railroad Company, who appeared to be prominent throughout, while the end companies were disposed of in a few words, such as giving them the same rights, privileges, grants, etc. The word dollar did not occur in the whole bill. The entire issue of bonds were limited to the number of fifty thousand. It appeared to be, *what it really was*, Mr. Curtis' bill very greatly improved, and as such commended itself to the practical good sense of the Congress who have endorsed it.

As this bill left Mr. Sargent's hands, it was approved and endorsed by the sub-committee, with but one single alteration, and that consisted only in leaving the number of sections of land per mile blank.

I immediately prepared a copy of the bill, as approved by sub-committee, and laid it before Gen. McDougall, going over the whole bill in detail with him; and although, while approving it generally, he did not fully concur in all its details, yet so important did he conceive harmonious action to be, that waiving all other considerations, he agreed (with the concurrence of his committee), to report this bill as it was, word for word, directing me to call a meeting for the following day, February 23, 1862, for the purpose of obtaining the sanction of his committee.

Five days afterward, February 25th, by direction of his committee, he reported the bill to the Senate, asked to have it printed and referred back to his committee, which was done a few days afterward, March 4th.

Mr. Campbell, Chairman of the House committee, having, by direction of his committee, reported the same bill to the House, where it was printed and referred back to his committee; and this is how both House and Senate committees adopted and reported the same bill to their respective Houses.

The plan of bill having now been settled and decided upon, being printed and before the public, it was of course open to criticism and amendments.

As was anticipated, the Iowa and Chicago interest revived the old local quarrel between Missouri and Iowa, and demanded amendments calculated to advance their own, and to prejudice the Kansas and Missouri interests. Many concessions were made to them and they appeared satisfied.

Next the great Northwest were agrieved, and demanded a line from Minnesota to South Pass. This was finally compromised by providing, that whenever a road should be built across Minnesota or Iowa to Sioux City, then a branch should be built from Sioux City to connect with Pacific Railroad line at a point not farther west than the one hundred and second parallel of longitude, giving them six sections of land per mile, and half the number of bonds per mile.

Various minor amendments were made, and finally the bill was reported to the House, March 14th, printed with the amendments,

and made the special order for March 25th. It was again postponed on account of the Tax bill till April 1st, and again till April 8th, when the Tax bill having passed the House, the Speaker stated the business next in order to be the consideration of the Pacific Railroad bill.

Mr. Stevens raised the question of order, that as this bill contemplated an appropriation it should go to the Committee of the Whole on the state of the Union. After some debate the Speaker sustained the point of order.

Mr. Campbell moved that the rules be suspended, etc.

Mr. Lovejoy asked, before a vote was taken, to submit an amendment for the purpose of having it printed.

The rules were suspended—Mr. Dawes in the chair—and the committee proceeded to the consideration, as a special order, of Bill No. 364, etc.

Mr. Campbell moved, and by unanimous consent the first reading of the bill was suspended.

Mr. Campbell then addressed the committee, explaining the features of the bill and giving much statistical information.

Mr. Phelps, of California, then obtained the floor, but yielded to Mr. Cobb, who moved the committee rise, it being 4 P. M. At 4:10 the House adjourned.

April 9th Mr. Campbell moved that the substitute, reported yesterday, be ordered printed.

House went into Committee of the Whole on Pacific Railroad —Mr. Dawes in the Chair—and Mr. Phelps addressed committee in favor of the bill for about one hour.

Mr. Kelly, of Pennsylvania, then followed in a speech of about thirty minutes.

Mr. Sargent then followed with a speech of about one hour.

Mr. Campbell then moved that the committee rise.

Mr. Lovejoy asked Mr. Campbell to postpone his motion, that they might go into the House and postpone the special order, but Mr. Campbell declined, and the committee rose.

Mr. Lovejoy then moved to postpone the special order to one week from Monday next.

Mr. Campell rose to a point of order, that Mr. Lovejoy's motion was not in order except by unanimous consent.

Speaker overruled the point of order.

Mr. Vallandingham then rose to a point of order, that the House

could not postpone a special order in the Committee of the Whole, except by a two-thirds vote, under a suspension of the rules.

Speaker overruled it, and pending the question, Mr. Vallandingham moved an adjournment, which was carried at 4:10.

April 10th, Mr. Lovejoy stated the reason why he desired to postpone the special order was, to give time to consider the bill. He had consulted with select committee and finds they are willing to postpone for one week; he, therefore, modifying his motion accordingly.

Mr. Campbell, finding a disposition on all sides, to give the Pacific Railroad that consideration to which it was entitled, and as the consideration of the Tax bill had prevented examination of this bill, and as the substitute had only just been printed, yielded to this disposition for a few days.

Mr. Stevens moved to amend so as to postpone until a week from Monday next.

Mr. Sargent called for the yeas and nays. Not ordered.

Mr. Campbell called for tellers, which were ordered.

Mr. Stevens' amendment disagreed to. Question recurring on Mr. Lovejoy's motion, it was agreed to.

Mr. Stevens then asked to have some amendments printed which he desired to offer.

April 17th, Mr. Campbell moved to close general debate in one hour, but as objection was made, withdrew his motion.

House resolved itself into Committee of the Whole—Mr. Hickman in the chair—and Mr. Lovejoy had the floor.

Mr. Lovejoy attacked the bill, severing it section by section; he endeavored to create the impression that the bill was so defective that a Pacific Railroad could not be built under it; that the grants of land were too bountiful; that the provision exempting them from taxation was unheard of—that it would absorb so large a portion of public land, as to render the homestead policy entirely useless.

He did not regard it as a military necessity; he doubted whether it was intended ever to build the road under the bill; the ends might, but the center would not be built; he deprecated the policy of employing companies at the ends, and was in favor of having but one company to build the entire road, etc., etc.

The true cause of Mr. Lovejoy's opposition arose from the fact that he was probably enlisted in favor of Perham Company, who

were not recognized in the bill of committees, whose bill he introduced as a substitute immediately after his speech, and had it printed. This bill gave all the grants to the Perham Company, and was accompanied by pamphlets, written by some one in Perham's interest, attacking the committees' bill, and recommending the adoption of the Perham bill in its place.

After Mr. Lovejoy had concluded, Mr. Cradlebaugh obtained the floor and spoke for about twenty minutes in favor of the bill. He gave a description of the silver mines of Washoe, and the vast business which would accrue to the road from its location through that Territory.

He was followed by Mr. Dunn, of Indiana, who made a rambling speech, the object of which seemed to be to decry the merits of the South Pass and contiguous routes, and to advocate the adoption of a route through Kansas and Colorado *via* the Cochetopa, or some other Pass thereabout, the precise location of which he did not seem to have a very clear idea, but through a country pronounced impracticable by Government surveys. Mr. Dunn spoke about one hour.

Mr. Dunn was followed by Mr. Edwards, of New Hampshire, in a speech, in which he declared himself in favor of a Pacific Railroad, but was not prepared to commit himself in favor of the committees' bill.

He was followed by Mr. Wilson, of Iowa, who, while declaring himself in favor of a Pacific Railroad, found a good deal of fault with the committee bill, and indicated numerous amendments which he considered absolutely necessary, before he could give it his support.

Mr. Wilson was followed by Mr. Watts, of New Mexico, who made a good humored, practical speech, full of good, sound common sense, and it had much weight, from the fact that he advocated the bill of the committees, which precluded New Mexico from enjoying the benefits of the bill; he said he would, and he did stand by the bill of the committee,

Mr. Pike, of Maine, followed in a speech favoring the postponement of the whole subject till the next session of Congress, his speech leading the movement to postpone the bill, of which there was really great danger.

He was answered by Judge Kelly, of Pennsylvania, who gave very excellent reasons why this bill should not be postponed.

Mr. Fessenden, of Maine, spoke in favor of Paeific Railroad, but objeeted to the bill of the eommittee, and favored the substitute of Mr. Lovejoy.

Mr. Morrill, of Vermont, followed Mr. Fessenden. He spoke against the passage of the bill at the present time, and advocated its postponement till the next session of Congress.

Mr. Blair answered Mr. Morrill's arguments effeetually, and severely eriticised the disposition shown to organize loeal hostility to the measure.

The debate of the day was elosed by Mr. Campbell, who ably answered the arguments of Mr. Lovejoy and others. He pointed out the inconsisteneies of the Perham bill, etc.

Committee rose, and House adjourned at 4:30.

April 18th, Mr. White, of Indiana, spoke against the bill—he was in favor of giving the grants to but one company, of reeommitting; the bill of eommittee was full of objeetions.

Mr. Sheffield also spoke unfavorably, and on motion of Mr. Lovejoy, the bill was postponed to Monday week, April 28th.

The result of general debate up to this time, developed much hostility to the bill of committee, and gave uneasiness to the friends of end eompanies.

Monday, April 28th, Mr. Campbell said:

"Mr. Speaker: The Committee on Pacific Railroad have had a further meeting during the past week, and adopted some of the suggestions which were made here in general debate, and have instrueted me to report an amendment. If the amendment of the gentleman from Illinois, Mr. Lovejoy, be withdrawn or voted down, the committee will recommend the adoption of the amendment I now present in lieu of the committee substitute. This question is the special order in Committee of the Whole while on state of the Union, and I give notice, that I will call it up to-morrow after the morning hours. I now move that the amendment I now submit, be ordered to be printed."

Motion agreed to.

April 30th, Mr. Campbell moved that the House resolve itself into Committee of the Whole on Pacific Railroad Bill, and that all debate be closed in five minutes.

Motion agreed to.

The bill was taken up to be perfected, and for that purpose to be read section by section.

On motion of Mr. Wilson, of Iowa, the first section of the committees' bill, relating to the incorporation of the Central Company, was amended so as to define more fully, the powers and duties of the incorporators.

Mr. White, of Indiana, moved that five Commissioners be appointed by the Secretary of the Interior, to act with those named in the bill, in the organization of the company, and also that the Secretary of the Interior appoint two Directors, after the organization, on the part of the Government. He thought the interest of the Government should be protected, as it would have millions invested in the road. Adopted.

A large number of names were inserted as Commissioners, and the enemies of the bill endeavored to make these additions the occasion of ridicule, when Mr. Sargent said it was time such amendments were voted down. The position of Commissioner entailed only hard work without pay, and gentlemen could not have read the bill aright who sought to get their friends in as corporators.

Mr. Morrill, of Vermont, moved to amend so as to require the subscriptions to the stock to be paid into the Treasury of the United States.

Mr. Sargent opposed this, as making the United States the treasury of a private company. The Treasurer of the United States has his own peculiar functions to perform in handling public money, and ought not to have the handling of private funds. It was never intended to use the vaults of the United States for the keeping of private funds.

Amendment withdrawn.

Mr. Stevens, of Pennsylvania, renewed it so far as to require ten per cent. to be paid into the Treasury.

Mr. Campbell opposed the amendment. He could see no propriety in paying the funds of a private company into the Treasury of the United States.

Without coming to any conclusion the committee rose.

May 1st, the House resolved itself into Committee of the Whole and resumed the consideration of the Pacific Railroad bill. Mr. Stevens' amendment was so modified as to require ten per cent. to be paid into the treasury of the company, and adopted.

Mr. Morrill returned to the charge, and moved that one half of the capital stock should be subscribed for, and $10,000,000 be actually paid into the Treasury of the United States, before the com-

pany should have a right to organize. He wanted a genuine working company. It was usual to require the whole stock to be subscribed. Any man could, by paying $20,000, get possession of all the grants and funds granted in the bill.

Mr. Campbell said it was unusual to require more than five per cent. to be paid before organization. We required ten. The company could not draw a dollar from the Treasury until millions had been subscribed, and part of the road built. The gentleman from Vermont was opposed to the whole scheme at this time, and it was evidently the result of that opposition which led him to propose to have $10,000,000 placed by the company in the Treasury of the United States. No company could afford to have so much dead capital. The Government had guarantees enough. He hoped the friends of the bill would vote down the amendment.

At this point in the proceedings Mr. Lovejoy endeavored, vigorously, to procure a substitution of the Perham bill for that of the committee, which led to a long debate on questions of order, which was participated in by Messrs. Sargent, Stevens, Campbell, White, and Lovejoy, and ended in the withdrawal of the amendment by Mr. Lovejoy.

Mr. Sheffield, of Rhode Island, moved to require ten per cent. to be paid on 50,000 shares, instead of 2,000. He thought the amount entirely too small. He deemed it unsafe to the public to allow a corporation of this magnitude, capable to perform so much mischief as this corporation may perform, to be launched out on so small capital.

Mr. Phelps, of California, regretted very much to see this kind of amendments offered. He could not think they were offered with any other purpose than to embarrass the bill. The fact that it was a large corporation, did not justify in embarrassing it with conditions.

Amendment lost.

Mr. Shanks, of Indiana, moved to strike out the right to take from the public lands stone, earth and timber for the construction of the road. He thought the alternate sections for ten miles on either side of the road enough.

Mr. Sargent opposed the amendment. It could not injure the Government to allow the company to take the stone and timber along the route, and apply it to the uses of the road, when at pres-

ent it is of no use whatever, and may never be, unless the road is built.

Amendment lost.

Mr. White moved to reduce the right of way from four hundred to two hundred feet. Mr. Campbell had advised with practical engineers on the subject, and thought four hundred not too much, considering the heavy embankments and cuttings.

Amendment withdrawn.

On motion of Mr. Stevens, the iron to be used in the road was required to be of American manufacture.

Mr. Cradlebaugh proposed that the lands, after being conveyed to the company should be opened to prospectors for metals, and providing that a jury assess damages.

Mr. Sargent was opposed to patch work legislation in regard to the mines. Mineral lands were excepted in the bill. The local care of the mines had been left to the people. When that system was changed he desired it should be by a carefully considered bill, not by incidental legislation.

Amendment lost.

Mr. Wilson moved to reduce the rate of interest on the bonds from six to five per cent., which was opposed by Mr. Campbell, and lost.

Mr. Holman moved to insert a provision that the road should remain a public highway for the use of the Government of the United States free of charge.

Mr. Campbell opposed the amendment. The Government must come forward with a liberal hand, or the enterprise must be abandoned forever. The necessity was upon us. The question is whether we shall hold our Pacific possessions.

Amendment lost.

Mr. Shelbarger, of Ohio, moved that surveys be first made of a through route, demonstrating its practicability before any bonds should issue.

Mr. Campbell answered him, and the amendment was lost.

The committee then rose.

On Monday, May 5th, a test vote was taken on the question of going into Committee of the Whole on the Pacific Railroad Bill, and resulted, 56 yeas, 49 nays. Encouraged by this the friends of the bill took fresh courage, and prepared for the conclusive struggle.

Messrs. Campbell and Sargent proposed, on behalf of the committee a great many amendments to the pending bill, changing the starting point of the Central Company from the western boundary of Kansas to the one hundred and second meridian of longitude, striking out the Nevada company, etc. The change in the starting point, and certain additional privileges granted to the Iowa branch, were the results of a compromise between conflicting interests, that had given infinite trouble, labor and anxiety to the friends of the measure. The compromise satisfied all parties, and did justice to all, and the effect of the cheerful cooperation of all parties who favored *a* bill against those who were opposed to *all* bills, was apparent throughout this day.

Mr. Kellogg, of Illinois, moved to strike out of the bill the ninth section, providing for the companies on the ends. He had no objection to that portion of the bill providing for a road from the one hundred and second meridian of longitude to the State line of California. But the bill proposed to build an independent road in California and one in Kansas. He was opposed to it. The center would never be built. The bill proposed three roads.

Mr. Campbell replied, the amendments would destroy the whole bill. Greater inducements were offered to build the central portion. The ends had but $16,000 per mile, the center $48,000 and $32,000. Government had a mortgage on the whole.

Amendment lost.

Mr. Kellogg moved to amend so as to require forty miles of the Central part to be built before any part of the bonds should issue. He wanted some security to the country that the central portion would be built. Why not let the people subscribe to the whole road? Why make three charters instead of one? He called upon the friends of the bill to give this poor guarantee that the central would be built.

Mr. Sargent said, because we are friends of the bill we vote down, when we are able, all such amendments. What security to the Government or good to any body, would arise from compelling the company to go five hundred miles into the wilderness to build forty miles of road without connection with any other road? The rails, ties, etc., would have to be carried in wagons. The gentleman would impose a useless, ridiculous task. Mr. Sargent was in favor of a Pacific Railroad *now*, and for that reason was in favor of commencing at the ends, not in the middle. Books of all the compa-

nies would be open for subscriptions, for much capital would be needed from the people.

The amendment was lost.

Mr. Lovejoy moved to insert a provision, that if a road is not built from the Missouri river to the city of Sacramento by the 1st of January, 1874, the road should be forfeited. He believed, notwithstanding the views of the committee, the bill could not build the road. It would build the ends only. He thought his amendment would test the sincerity of the friends of the bill in their purpose to construct the road across the continent.

Mr. Campbell had no objection to the amendment. He believed Congress would always act liberally towards any company endeavoring to fulfil its obligations.

The amendment was adopted.

Mr. Morrill, of Vermont moved to amend so that no bonds should issue, or any lands be granted until surveys should demonstrate the practicability of the route, or until, in the opinion of the President of the United States, the circumstances of the country shall justify the building of the road. He had been astonished that a matter of so much importance should be considered in so thin a House. His amendment would prevent anything being done that could involve the Government, till the circumstances of the country would warrant it. At the proper time he would be in favor of a railroad. He was not in favor of a sham. Under the bill we would get somebody to take a vast quantity of bonds and public lands, but would get no road. He desired a practical survey. We had never had anything but picture-books—mere barometrical surveys. Those surveys show that there are extreme difficulties to be overcome. He regarded the bill as purely ornamental; he was opposed to increasing our annual taxation five or six millions, as this bill would.

Mr. Sargent said that the gentleman did not desire to arrest legislation when the tax bill was under consideration, although they had to resort to frequent calls of the House, to get a quorum. They were there to attend to the legislation of the country, and were not excused by the remissness of others. The gentleman would not go on with the work till more surveys, and hence more picture-books had been made. But there was more in those picture-books, than the gentleman seemed aware of. He showed by the abstract of grades, as shown by Government surveys, the practica-

bility of the route, and explained the value of barometrical reconnoisances, illustrations by the surveys made by our company over the Sierras. The gentleman was in favor of a Pacific Railroad, except when it could be passed. If we continue to put off the Pacific Railroad till the war debt is paid, we will never have it. We need it to develop the resources of the country, and the greater the debt, the more we would need such development, as a farmer would need to more carefully cultivate his farm if he fell into debt. The road was a political necessity. The present generation in California was loyal, but neglect all the interests of the State, and squeeze it with taxation, and a new generation might ask what they were gaining. We must break down the barrier between the two great sections of the country—legislate for the future as well as the present. He trusted that the bill now so near completion would be sent to its final vote without insidious amendments, distractive of its object.

The amendment was lost.

Mr. Aldrich moved to insert a provision for a northern road from the western boundary of Minnesota to Puget Sound, and was humorously replied to by Mr Watts, and the amendment rejected.

Mr. Kellogg again moved his amendment, to have the forty miles of the central division built first, which Mr. Stevens said was like the boy, who, in digging for a squirrel, commenced at the bottom of the hole and dug upwards.

His motion again failed.

The committee having completed its labors, on motion of Mr. Campbell, rose and reported the bill to the House, where it was considered, engrossed and read a third time, and ordered to be printed with the amendments, and by unanimous consent, the final vote on the bill was set for the next day at two o'clock P. M.

At two o'clock on May 6th, the speaker stated that the hour had arrived for taking the vote on the Pacific Railroad bill, and the question being taken by yeas and nays, the bill passed—yeas 79, nays 49. And thus the Pacific Railroad bill passed the House.

SENATE PROCEEDINGS.

May 7th, the bill having been engrossed, was reported to Senate from the House, and on motion of Mr. McDougall, was referred to his committee. He stated that it was in substance the same bill

reported by Senate committee to Senate, and gave notice that he should bring it to the attention of the Senate at an early day.

On motion of Mr. Lane, of Kansas, four new members were added to the committee: Messrs. Wade, Lane, of Kansas, Browning and Kennedy, and at Mr. McDougall's request, I called a meeting of Senate committee for next day, May 8th.

May 8th a meeting of Senate committee was held, where the bill was read and discussed, the general sense of the committee being to agree to report it with very slight amendments. It was agreed to meet again on Monday the 11th, and report the bill immediately.

May 11th some of the members of the committee not having returned, meeting was postponed till to-morrow, Tuesday, 12th.

May 12th, committee met at 9 A. M., and completed their work on the bill. Most of the amendments were verbal and unimportant, except the one with regard to Iowa roads.

The House bill required the main Iowa branch to be completed in the same time with the Kansas road, viz: one hundred miles per year, etc. In view of the fact that no railroads were completed across Iowa, the Senate committee did not require them to commence until these connections were completed. The amendment was made in a spirit of liberality and fairness, but made much trouble afterward.

Mr. McDougall reported the bill to Senate May 12th, and gave notice that on to-morrow he should move to have the bill made the special order for Thursday, the 15th, on account of the expected absence of the two Missouri Senators.

It was soon afterwards ascertained that the Iowa and Chicago interests were opposed to the Senate amendment as to the Iowa branch, also to the Kansas road, and would endeavor to defeat the Kansas company, if all companies had to be excluded. They set on foot many reports calculated to prejudice Senators and others, and when the bill was called up, this opposition began to manifest itself strongly. The Senate refused to accede to Mr. McDougalls's motion to make the bill a special order. But Mr. McDougall succeeded in getting it in such position as made it the unfinished business of the morning hour each day until disposed of.

Tuesday, May 20th, Mr. McDougall called up the Pacific Railroad bill.

Mr. Fessenden opposed taking it up. Mr. Wade asked that it be postponed a day or two. Mr. Clark opposed taking it up, also Mr.

Howe and Mr. Wilson. Mr. McDougall persisting, a vote was taken, and Mr. McDougall's motion prevailed.

Mr. Harlan, of Iowa, then gave notice that he should move that the bill be recommitted to the Committee on Public Lands, of which he was Chairman, assigning various reasons therefor, but the real one being, to get hold of it, so as to restore the House amendment with regard to the Iowa branch, and make others prejudicial to the interests of the Kansas road. By insisting on the reading of the bill until the morning hour had expired, Mr. Harlan was defeated in his attempt to get his motion in that day, but his motion was next in order, after the reading of the bill had been concluded.

At this stage of proceedings the Tax bill came up for consideration, and nothing more was done with the Pacific Railroad until after its passage.

Ad interim, I, with others exerted myself to allay the opposition of Messrs. Harlan and Grimes. Here let me do Mr. McDougall the justice to say that he agreed for himself and his committee, to yield to Mr. Harlan's views—restoring the House amendment with regard to Iowa branch. I also procured the assent of the Kansas company to shortening their line from the one hundred and second to the one-hundredth meridian, and also to some other alterations, insisted upon by Mr. Harlan, which withdrew his opposition. Mr. Harlan was subsequently added to the Pacific Railroad Committee, and entirely gave up his idea of having the bill referred to the Public Land Committee.

At several subsequent meetings of the committee, Mr. Harlan presented his amendments, which were adopted, with one exception, and on that a compromise was made, to which Mr. Harlan reluctantly consented. He insisted on making Fort Kearney the point where the Kansas road should terminate. But it was finally decided by a vote in the committee, to be the one-hundredth meridian of longitude, between the Platte and Republican rivers. And to the bill in this shape the committee agreed to stand.

On June 9th, Mr. McDougall called the bill up.

Mr. Wade insisted upon taking up a bill of his own.

Mr. McDougall objected, and called for the yeas and nays.

Mr. Wade's motion was sustained, and his bill considered and passed.

Mr. McDougall then tried to make it a special order, but Mr. Fessenden opposed. He, however, succeeded in having the bill or-

dered printed with the final amendments of the committee, and to come up in the Senate to-morrow at one P. M.

June 10th, other matters crowded the Pacific Railroad bill out until late in the afternoon, when Mr. McDougall made another attempt to have the bill made the special order for to-morrow, June 11th. In this he was opposed by Messrs. Wade and Clark—both of his committee—and Mr. Wilson, and finally, on Messrs. Wade, Wilson and Clark's advice, they agreeing, if he would let it lie over, to take hold of it and assist him to press it through, he reluctantly consented, rather than give occasion of offense to three Senators of influence, who were really friendly to the bill.

Wednesday, June 11th, Mr. Latham called up the Pacific Railroad bill, and moved to postpone all prior orders, to which Mr. Wilson objected, as he wanted another subject disposed of. Messrs. McDougall, Harlan, Latham, and Pomeroy insisting, the yeas and nays were ordered, and the motion agreed to.

Mr. McDougall announced that the committee had agreed upon the amendments unanimously, and the Senate proceeded to their consideration.

Mr. Trumbull wished to know the reason for changing the House bill in regard of meridian of longitude at commencement.

Mr. Trumbull raised the point, that it would bring the commencement within the State of Kansas, and the United States had no power to grant rights, etc., within a State.

Mr. Pomeroy explained, but not satisfying Mr. Trumbull.

Mr. Collamer called on Mr. McDougall to explain the general features of the bill, which he did occupying about half an hour.

Mr. Lane, of Kansas, moved to postpone the bill and make it special order for one o'clock to-morrow. It gave rise to a debate. Messrs. Fessenden, Morrill, Trumbull and Wilson, opposed making it a special order. Messrs. McDougall, Latham, Lane and Browning, advocating it. Mr. Lane finally withdrew his motion, and on motion of Mr. Wilson its further consideration was postponed until to-morrow, at one P. M. June 12th, Mr. Latham made his speech on the Pacific Railroad. After disposing of a few amendments, Mr. Morrill commenced a speech, when, on motion of Mr. Doolittle, the Senate went into executive session, with the understanding that consideration of the bill should be resumed on the following day.

June 13th, Pacific Railroad bill came up as unfinished business,

but there being a general desire to act on the naval appropriation bill, the Chairman of the Pacific Railroad Committee yielded, with the expectation that the naval bill would occupy but a short time. It, however, took up the time until Senate adjourned, without concluding it, and nothing was done on the Pacific Railroad bill.

June 16th, the naval appropriation bill came up as unfinished business, and upon its passage, the Vice President gave notice that the Pacific Railroad bill was before the Senate.

Mr. Hale asked consent of Mr. McDougall to introduce a resolution, fixing the hour of daily meeting at eleven, instead of twelve o'clock. Mr. Latham suggested to the Senate to lay aside the Pacific Railroad bill informally, to consider the resolution. Mr. McDougall gave way; but finding it would lead to discussion, proposed to let the resolution go over till to-morrow; but a vote being taken on it, the resolution was taken up, and consumed all the balance of the day. Mr. McDougall again took the floor and declared his intention not to yield again except for an adjournment, which gave him the right of the floor at one P. M. to-morrow.

June 17th, the Pacific Railroad bill came up in Senate at one P. M. for the first time in earnest, the Senate resuming its consideration as in Committee of the Whole. The debates of the day were voluminous and interesting, and will be found in the *Globe*, containing proceedings of June 17th.

June 18th, Senate engaged on amendments to Pacific Railroad bill all day. (See debates of *Globe*, proceedings of June 18th.)

June 19th, Senate engaged on Pacific Railroad bill all day. (See debates of *Globe*, proceedings of June 19th.)

June 20th, resuming the consideration of Pacific Railroad bill, the Senate completed their labors upon it, and it finally passed by a vote of 35 to 5. Those voting against it, being Messrs. Howe, King, Pearce, Wilkinson and Wright; Mr. Ten Eyck asking to be excused from voting, and Mr. Powell stating that he was paired with Mr. Simmons, but should have voted no.

The only unfavorable alterations of any importance were made by the New England Senators. But with regard to retaining the per centage, and as to the mode of repayment to the United States, these might perhaps have been remedied by a Committee of Conference, but it was thought best not to risk sending the bill back again to the Senate.

June 24th, the bill as passed was referred to the House Commit-

tee, and by them reported to the House on June 24th, with a recommendation that the House do concur in all the Senate amendments, which was accordingly done—the House concurring by a vote of 104 to 21.

The last action of the House on the Pacific Railroad, was upon a motion of Mr. Sargent, to print 2,500 copies of the bill, which was agreed to.

The bill was signed by the President, and became a law on July 1st, 1862.

The bill having passed, I immediately prepared a map and designation of our route as required by Section 7 of the act, which says that "Whenever said companies shall designate the general route of their road, and file a map of the same in the office of the Secretary of the Interior, he shall cause the lands for fifteen miles on each side of said route or routes, to be withdrawn from private entry ~~terprise~~, emption and sale."

This was so altered in the bill, for the purpose of keeping speculators and others from taking up the Railroad lands before they could file their final map.

I found Messrs. Smith and Usher, Secretary and Assistant Secretary of the Interior, ready and willing to do anything in their power to advance the interests of the Pacific Railroad, and in advance of the signing of the bill by the President, they allowed me to file the necessary papers, agreeing to forward the proper instructions to the land offices, to withdraw such lands from market, upon the signing of the bill. 1862

I left Washington Friday, June 27th, for New York, for the purpose of making necessary inquiries, and securing provisional contracts, if possible, for the Iron Equipment, etc., for the first fifty miles of our road. My desire being to make such contracts, if possible, for Government bonds—and so that, if necessary, the first fifty miles could be completed by the fall of 1863.

Finding that Iron was rapidly advancing in price, and mills beginning to refuse to take orders, most of them being filled up with orders for many months ahead, I placed matters in the hands of G. T. M. Davis, Esq., with instructions to immediately close some kind of arrangement with iron, locomotive and car men, upon the best terms he could get, before further advances took place. Any contract or agreement not to be binding on us until ratified by the Central Pacific Railroad Company.

Mr. Davis succeeded in making a contract with Norris & Co., of Philadelphia, for eight locomotives, deliverable in January, to be paid for entirely in Government bonds, when issued. (See contract.) Also, obtained a proposition from the Lackawana or Scranton Iron Company, for 5,000 tons of rails, deliverable in time for the completion of our first fifty miles as proposed. (See letter of Mr. Davis.) Also, obtained a proposition from Wason & Co., of Springfield, for eight passenger, four baggage and sixty freight cars, deliverable as above. (See proposition.)

All of these contracts and propositions to be subject to the approval of our Board of Directors, which was required to be given within thirty days from July 21, 1862, they otherwise to be void. Unless these contracts are accepted by our company, I doubt if it will be possible to otherwise arrange to procure this material so that the first fifty miles can be finished by the fall of 1863, which I regard as quite essential to be done, in order to complete the entire line through California as contemplated in the bill.

Herewith accompanying, you will find :

Three contracts with Norris & Co., of Philadelphia, for locomotives.

Proposition of Danforth, Cook & Co., of Patterson, for locomotives.

Proposition of Wason & Co., of Springfield, for cars.

Proposition of Lackawana Iron Company, for Iron.

Letter from G. T. M. Davis, explaining the results of his negotiations.

Deeming it of importance that the President should fix the guage of road as soon as possible, I procured several letters from influential Railroad managers, among which is one from Mr. Garrett, President of the Baltimore and Ohio Railroad, recommending a five feet gauge, and forwarded them to Mr. Sargent in Washington, who went to see the President several times about the matter, but found him too much occupied to take the time necessary for a proper examination.

Mr. Sargent also kindly endeavored to procure the President, to establish the west base of the Sierra Nevadas, but owing to the above causes was obliged to postpone it until next winter.

I would further state that a resolution was passed by the Senate making an appropriation out of the contingent fund of the Senate for the purpose of altering the plates and printing 1,000 copies

each of certain maps in possession of the Bureau Topographical Engineers; upon which maps so altered you will find the line of our Railroad, as well as others in California, laid down.

These maps were freely distributed among Senators, Representatives and others, and proved of the greatest assistance in furthering our interests in Washington.

I would also state, that in pursuance of an agreement with Hon. S. A. McDougall and Hon. T. G. Phelps, made in Washington, I assigned to certain parties representing the interests of the San Francisco and San Jose Road, the rights, grants and franchises, given us for that portion of the road between Sacramento and San Francisco. Also, that in order to provide for the contingency of the non-passage of the Pacific Railroad bill, I prepared early in the session a bill making a grant of lands for railroads in California, including our own; which bill was introduced into the House by Hon. A. A. Sargent, and into the Senate by Hon. M. S. Latham, and referred to the appropriate committee, but the aspect of the Pacific Railroad affairs became so encouraging that all efforts were concentrated upon the latter, and consequently nothing further was done with the land bills.

In justice to the Hon. Henry Wilson, of Massachusetts, than whom the Pacific Railroad had not a firmer or truer friend, I desire to state that to him are we indebted for the passage of that feature of the bill giving us the timber on mineral lands.

As the bill passed the House, mineral lands were excepted from the operations of the act.

Knowing that nearly all our lands in the Sierra Nevadas might possibly be decided to be mineral lands, and as no provision was made for our taking other lands in lieu thereof they would be lost to us.

Aware, also, that they were covered with timber, and that it was of the greatest importance to us in the future that we should have this timber for fuel, etc., I drew up a little amendment which read as follows: "But when the same shall contain timber, the timber thereon is hereby granted to said Railroad companies;" and when the bill, as it passed the House, came before the Senate committee urged upon them the importance of adopting this or a similar amendment, and the injustice of depriving us of both lands and timber, while if no mineral had existed on them, the provisions of the bill, as passed, would give us both lands and timber.

After discussion upon several occasions, although supported by Gen. McDougall, the Chairman, it was lost in committee, on a direct vote, by a majority of one, principally in consequence of the opposition of Mr. Cowan, of Pennsylvania, who conceived that we might find coal lands among the mineral lands, and then the timber would be neccssary in order to work them.

Somewhat discouraged by the action of the committee on this particular point, I applied to several Senators friendly to the bill, to offer it as an amendment in Senate, but while they acknowledged its justice and importance, they did not like to offer in Senate an amendment rejected by committee.

As a last resource, I saw Senator Wilson, who, after an explanation, kindly offered to take charge of the amendment, and at the proper time offer and support it.

A record of the proceedings will show that he fulfilled his promise to the letter, the amendments passed, and to him, therefore, are we indebted for the passage of this feature, without which our land grants would have been comparativcly worthless.

Having successfully accomplished the objects of my mission, I sailed from New York in the steamer Champion, July 21, 1862, arriving in San Francisco August 17, 1862.

* * * * * * * *

I have the honor to submit the following testimonial letter, signed by forty-six Congressional representatives and seventeen Senators, and by Mr. Forney, Secretary of Senate, approving my course with regard to the Pacific Railroad bill in Washington:

WASHINGTON, June 24, 1862.

T. D. JUDAH, Esq., of California—Dear Sir: Learning of your anticipated speedy departure for California on Pacific Railroad business, we cannot let this opportunity pass without tendering to you our warmest thanks for your valuable assistance in aiding the passage of the Pacific Railroad bill through Congress.

Your explorations and surveys in the Sierra Nevada Mountains have settled the question of practicability of the line, and enabled many members to vote confidently on the great measure, while your indefatigable exertions and intelligent explanations of the

practical features of the enterprise have gone very far to aid in its inauguration.

Very truly yours,

JAMES H. CAMPBELL,
Chairman Select Committee of Pacific Railroad.

A. A. SARGENT,
Of Sub-Committee of House.

REPRESENTATIVES.

R. Franchot,
Schuyler Colfax,
Wm. D. Kelly,
T. G. Phelps,
Frank F. Blair,
S. Edgerton,
J. H. Goodwin,
A. W. Clark,
Burt. Van Horn,
Augustns Frank,
H. G. Blake,
John A. Bingham,
W. H. Wallace,
R. E. Fenton,
I. N. Arnold,
John B. Alley,
William Watt,
W. F. Kellogg,
Erastus Corning,
C. Vibbard,
Thos. S. Price,
E. Aug. Smith,
John B. Steele,
Thaddeus Stevens,
Edward Haight,
Edwin H. Webster,
J. S. Watts,
W. A. Wheeler,
B. B. Van Valkenburgh,
Alfred Ely,
Jno. F. Potter,
Wm. Windom,
F. F. Lowe,
Elihu B. Washburn,
Saml. F. Worcester,
Wm. T. Cutter,
Cyrus Aldrich,
George W. Julian,
F. C. Beaman,
Theo. M. Pomeroy,
Alex. H. Rice,
C. B. Sedgwick.

SENATORS.

S. C. Pomeroy,
J. H. Lane,
A. Kennedy,
Daniel Clark,
H. B. Anthony
B. F. Wade,
Jas. A. McDougall,
Milton S. Latham,
J. W. Nesmith,
Edgar Cowan,
O. H. Browning,
J. B. Henderson,
R. Wilson,
L. M. Morrill,
John A. Wright,
Lyman Trumbull,
John C. Ten Eyck,
John W. Forney,
Secy. U. S. Senate.

Accompanying, please find:—

1—A set of all Pacific Railroad bills offered at this session of Congress; also Curtis' Bill.
2—Set of Pacific Railroad reports with maps.
3—Debates on Pacific Railroad in present Congress.
4—People's Pacific Railroad charter and address.
5—Two pamphlets against present bill, and answers.
6—Charter, etc., of Leavenworth, Pawnee and Western Railroad of Kansas.
7—Copy of assignment from Sacramento to San Francisco.
8—Three contracts with Norris & Co., for locomotives.
9—Proposition of Wason & Co., for Cars.
10—Proposition of Lackawana Iron Company for 5,000 tons of iron.
11—Proposition of Danforth, Cook & Co., for locomotives.
12—Letter of G. T. M. Davis, respecting iron contracts.
13—Letter of Wm. Garrett, President of Baltimore and Ohio Railroad respecting guage.
14—Letter of Henry Tyson, respecting guage.
15—Sundry letters respecting the working of engines on heavy grades.
16—Copy of bill granting lands in and of railroads in the State of California.

Trusting my course and action on this subject, while absent, will meet your endorsement and approval,

I am, very respectfully,

THEODORE D. JUDAH;

Chief Engineer and Accredited Agent C. P. R. R. Co. of California.

June 24th 1862

№ 5

REPORT

OF THE

Theodore D Judah

CHIEF ENGINEER

UPON

RECENT SURVEYS, PROGRESS OF CONSTRUCTION,

AND AN

APPROXIMATE ESTIMATE OF COST

OF

FIRST DIVISION OF FIFTY MILES

OF THE

Central Pacific Railroad of Cal.,

JULY 1st, 1863.

SACRAMENTO:
JAMES ANTHONY & CO., PRINTERS, UNION BOOK AND JOB OFFICE.
1863.

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Central Pacific railroad. Chief engineer

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REPORT OF THE CHIEF ENGINEER.

ENGINEER'S OFFICE,
JULY, 1863.

To the President and Directors of the Central Pacific Railroad Company of California:

GENTLEMEN—Herewith I present a Report upon the recent surveys, progress of construction, and an approximate estimate of the cost of the 1st Division of 50 miles of your road.

It being determined to place a portion of the work upon the 1st Division under contract during the Fall and Winter of 1862, surveys for the purpose of determining upon the line were commenced in October, 1862.

The first question arising upon location of the road was to determine if the present Sacramento Valley Railroad and its extension to Auburn Station could be used and made available as a portion of the location of our road. The advantage to be gained by adopting these lines were, the saving of time in work of construction, and the removal of rivalry and competition in business.

Upon investigation many and serious objections presented themselves. 1st. From foot of K street to Auburn, via Sacramento Valley Railroad, 43 miles; from foot of K street to Auburn, via Antelope line, 35 miles; difference in distance against Sacramento Valley Railroad, 8 miles.

2d. A clause in the Pacific Railroad Bill expressly says that no part of the appropriations therein contained shall apply to that portion of any road now constructed, a prohibitory clause which nothing but further legislation would remove.

3d. Another clause in the Pacific Railroad Bill requires all iron used in construction of road to be American iron. The iron upon the Sacramento Valley Railroad, being English, while that upon the Sacramento, Placer and Nevada Railroad, although American, weighing only 52 pounds per yard (a weight too light

for our purpose), presented another objection requiring further legislation.

4th. Another clause in the Pacific Railroad Bill requires that the mortgage to the United States shall be a *first mortgage*, a provision which could not be complied with without retiring the present issue of Four Hundred Thousand ($400,000) Dollars First Mortgage Bonds of that road, having about twelve years to run, drawing 10 per cent. interest, many of which are in the hands of foreign holders.

5th. The nominal cost of the Sacramento Valley Railroad was about $1,500,000, represented as follows:

1st Mortgage	$400,000
2d "	367,000
Stock	800,000
	$1,567,000

Although not the actual cash cost of the road, yet it stands represented by securities to that amount, and it is not likely that the bond-holders would consent to give up their 10 per cent. bonds for anything less than par, if indeed they would consent to part with them at all. This, then, is the nominal cost of that road as it now stands; but in order to place it in the position of a first class road, according to the terms of the bill, it would be necessary to relay it with new iron (the old iron being defective and nearly worn out), also to partially relay it with new ties; also to replace the wooden culverts with stone, and the trestle work with piers and abutments of masonry, and bridges; also to purchase anew a portion of the locomotives and cars, and to place the balance in complete repair, and alter the present equipment to conform to the new guage of 4' 8½"; also to erect suitable and permanent depot and other buildings in Sacramento, as follows:

2,000 tons new iron, delivered at $90	$180,000
40,000 cross ties, delivered at 70c	28,000
Permanent culverts and bridges on line	35,000
Bridge across American river	40,000
New locomotives and cars	35,000
Altering over and repairing equipment	20,000
Buildings, etc., at Sacramento	25,000
	$363,000
Deduct 2000 tons iron sold at $40	80,000
	$283,500

Making an expenditure in cash, say $285,000, in order to render it a first class road.

When we consider that the total cost of grading, ties, and track laying from Sacramento to Grider's (a point 3 miles nearer Auburn than Folsom) is but $400,000 (including American river bridge), of which but $250,000 in cash is paid by the Company, there can be but little question as to the wisdom of the course adopted in building a new line.

6th. A location to Grider's will secure to this road, in connection with the California Central Railroad, the Marysville and northern business, and prevent the construction of a new line reaching from the Lincoln line to Sacramento.

These considerations, therefore, have governed this Company in adopting the direct route via Grider's, and settled the question of location so far as the Sacramento Valley Railroad is concerned.

DESCRIPTION OF LINES SURVEYED FOR CENTRAL PACIFIC RAILROAD OF CALIFORNIA.

Barometrical reconnoisances have been made upon five different routes across the Sierra Nevada mountains, as follows:

BAROMETRICAL RECONNOISANCES.

1st. A route via Folsom, Greenwood and Georgetown.

2d. A route via Auburn and Illinoistown, Dutch Flat and Donner Pass.

3d. A route via Nevada and Henness Pass.

4th. A route via Downieville and Yuba Gap.

5th. A route via Oroville, Bidwell's Bar, Middle Feather River and Beckwourth's Pass.

ROUTE VIA GEORGETOWN.

Commencing at the terminus of the Sacramento Valley Railroad at Folsom, the distances were taken by odometer, and elevations by aneroid barometer, to a point 78 miles from Sacramento; thence aneroid observations were extended to the summit of the Sierra Nevada mountains, near the head of the middle fork of the American river, following the ridge between the south fork of the American and its northern tributaries, and middle fork of the American—the barometrical observations indicating that a grade of 150 feet per mile would be necessary in order to overcome the summit upon that route.

Commencing at Folsom the line of observations were as follows: Sacramento Valley Railroad Depot, Spruance's, Shaw's

Bridge across south fork of American River, Negro Hill, Berry's, Atchinson's, Young's, Cooper's Ravine, Bailey's, Knickerbocker Ranch, Harris' Ranch, Penobscot House, Greenwood, Halfway House, Georgetown (54 miles from Sacramento), Clipper Mills, Castle Hill, top of hill, foot of hill, Creek, top of hill, Work's Ranch, Cabin, Richardson's, Volcano Mill, top of hill, Emigrant Road, top of hill, Log Shanty, Ballard's, Pilot Creek, Ice House, Stockton's Upper Store, head of Pilot Creek Ditch, top of ridge.

Leave Emigrant Road 78 miles from Sacramento; leave Waggons, point in ridge, do. do.; descend to bottom of Middle American river, foot of hill; point in river do.; leave river and ascend to top of ridge, camp, summit of Sierras, distant 97 miles from Sacramento.

2D.—ROUTE VIA AUBURN, ILLINOISTOWN AND DUTCH FLAT.

As the located line of road follows this route, and is more particularly described herein, a further description of this barometrical reconnoisance is deemed unnecessary.

3D.—ROUTE VIA NEVADA AND HENNESS PASS.

Commencing at Folsom the observations were taken at the following points: Sacramento Valley Railroad Depot, Rock Springs, Mountain House, Dutch Ravine, Auburn Forks, Illinoistown Road, Dry Creek, Foster's, English Bridge, Globe Ranch, Wolf Creek, Boston Ravine, Grass Valley, Nevada, Turner's Mill, Blue Tent, South Yuba, Bell's Ranch, Lake City, Junction House, Devil's Backbone, Humbug Road, Snow Tent, Cherry Hill, Magenta Flume, Eureka, Forks, top of divide, Bowman's Ranch, Canon Creek, Eureka Ditch, Canon Creek Summit, Jackson's, Downieville Road, Old Emigrant Road, Henness Pass, Webber's Lake, Truckee Falls, Maples, Tule Lake House, Hunter's Ranch, Sardine Valley, Dog Valley, Neil's Ranch, State Line—143 miles.

This line was found impracticable on account of the crossing of the South Yuba, and objectionable from the absolute necessity of making a long detour, either to the north or south, in order to get from the Henness Pass to the plateau of the Truckee river, to avoid Dog Mountain, also from its moderately descending grade eastwardly, and consequently high elevation through the snow region.

4TH.—ROUTE VIA CAMPTONVILLE, DOWNIEVILLE, NORTH YUBA AND SIERRA VALLEY.

Commencing at the terminus of the California Central Railroad, at Lincoln, the line of observation was as follows: Lin-

coln, Kennebec Bar, Long Bar, Timbuctoo, Smartsville, Empire Ranch, Deer Creek, Keystone House, Ankeny's, Pleasant Valley House, Bridgeport, South Yuba, French Corral, Brickville, Sweetland's, San Juan, Freeman's Crossing, Middle Yuba, Camptonville, Sleighville House, Top of Ridge, Mountain House, Goodyear's Bar, North Yuba, Downieville, Mooney's, Charcoal Flat, Lima City, Howard's, Yuba Gap, Hale's, Sierra Valley.

From this point the railroad line would extend northeasterly through Sierra Valley, passing out through Beckwourth's Pass, and connect with the line of observations taken upon the Middle Feather river route; but in order to ascertain the hight of the divide between Sierra Valley and Little Truckee, or Maple's Creek, and the elevation of Dog Mountain route, the observations were extended on this line, continuing as follows: Arms Store, Summit of Divide, Forks Henness Road, Triplet's, Sardine Valley, Junction Truckee Emigrant Road, Perkins', Dog Valley, Top of Dog Hill, Neil's, Stout's, Junction Fuller's Road—145 miles.

The objection to this route was found in the rugged nature of the country through which it passed, the expensive crossing of Deer creek, south fork of Yuba, and the numerous deep ravines of their tributaries, and the necessity, as in the Henness route, of making a detour north through Sierra Valley and Beckwourth's Pass, in order to reach the valley of Truckee river.

5TH.—ROUTE VIA OROVILLE, BIDWELL'S BAR, MIDDLE FEATHER AND BECKWOURTH'S PASS.

Commencing at Oroville the line of observations were taken as follows: Oroville, North Fork, Bidwell's Bar, South Fork of Feather, Union Bar, Kanaka Bar, Bald Rock Canon, Indian Crossing, American Bar, Long Riffle, South branch of Middle Feather, Millsop Bar, Rinehart's Bar, Marble Cone No. 1, Marble Cone No. 2, China Wing Dam, French Cabin, Saw-Mill, Hartman's Bar, Delap's Wing Dam, Pyramid Rock, Scrubby Jacks, Rich's Point, Butte Bar, Onion Valley Creek, China Bar, Last Chance Ravine, Railroad Ravine, Gap Point, Webb's Bar, Colby's, Minerva Bar, Washington Bar, Rich Bar, Winters' Creek, Sailors' Bar, Nelson's Point.

From Nelson's Point in bed of Middle Feather river, 80 miles from Oroville, for next 17 miles (the river rising at an uniform grade, without obstruction), the line of observations were carried to the North across the divide between Middle Feather and Spring Valley Creek, a tributary of the north fork of Feather, as

follows: Nelson's Point, Flume, top of divide, foot of divide, Spring Garden Ranch, Bear Trap, Misenhamer's, top of hill, Cunningham's House, Jackson's, top of hill, foot of hill, Middle Feather River, 97 miles from Oroville, at which point the line of observations again touch the bed of the river, and are continued on as follows: Lower Ford, Upper Ford, Penman's. Leave river at 100 miles from Oroville. For next 10 miles, the observations were taken upon a line north of river as follows: Leave river top of Anthony's Hill, Anthony's House, Poplar Creek, point of river, 112 miles from Oroville, thence via river as follows: Point of river, north branch middle fork Feather, Beckwourth's House, foot of Sierra Valley, Butte Cabin in Sierra Valley, Bingham's Ranch, Marsh's Summit House, Beckwourth's Pass (131½ miles from Oroville); thence the line turns to the south and follows down through Long Valley and Pea Vine Valley to Truckee River at Fuller's Crossing, as follows: Beckworth's Pass, foot of pass, Long Valley, Road and Ranch, Pond Ranch, Antelope Springs, Alkali Summit, Alkali Lake, Pea Vine Summit, Pea Vine Hotel, Pea Vine Valley, Truckee Summit, Junction Stone's Road, Fuller's Crossing of the Truckee River, 160 miles from Oroville, and 283 miles from Sacramento.

The advantages of this route consist in its low grades and a lower altitude of summit than upon the other routes. But it also presents disadvantages, which render it next to impossible for us to avail ourselves of its advantages in this respect. It is 80 miles further from Sacramento to Fuller's Crossing of Truckee, by this route, than by our present location.

Bald Rock Canon, about 20 miles above Bidwell's Bar, is a rocky gorge in the Feather river, rising with smooth granite sides, almost perpendicular, being 3,000 feet high upon the north side, and 2,500 on the South side, the length of the canon being about 1½ miles.

In order to avail ourselves of the lower grades, it is necessary to run near the river, or at an elevation sufficiently high to be above high water; this renders necessary the crossing of all the ravines and tributaries, many of which run in gorges of great depth near their mouths, and also involves the necessity of curving up into them and running down again, in order to procure a suitable crossing.

From Nelson's Point to Bald Rock Canon, about 50 miles, the river runs in a gorge varying from 2,000 to 2,600 feet in hight, at a pretty steep slope, which near the river where our line runs, in many places is perpendicular and generally rocky. The course of the river between these points is

extremely tortuous and winding, the spurs of the mountains upon either side putting out sharply and running by each other like the fingers of two hands thrust together, this involves the necessity of many tunnels upon this 50 miles. The work of construction would therefore be vastly expensive and slow.

In view of our relations with the United States Government and the Union Pacific Railroad Company, who are to build about 1,700 miles in the interior, and who cannot commence until we reach the State line; in view of the increased cost of the line by this route, and the increased cost to Government of appropriation for 80 miles of additional road to the same point; in view of the additional time necessary to construct the additional length of 80 miles, and the physical impossibility of constructing the division from Bald Rock Canon to Nelson's Point in one year, the time required in Pacific Railroad Bill, this route is reluctantly placed among the list of those denominated unavailable for Pacific Railroad purposes, in the present position of railroad affairs.

A barometrical reconnoisance was also extended from the end of instrumental survey on Truckee river, down the same, to Stout's Crossing of the Truckee, thence up Steamboat Valley, and by the present traveled road across the Washoe mountains via Virginia City, down 6 mile Canon and Flowery District to Carson river, and down the same to Fort Churchill, as follows:

Terminus of Survey, Neil's, supposed State Line, Stout's Crossing, Truckee Meadows, Truckee City, Steamboat Springs, foot of Washoe mountains, Toll Road, top of hill, junction with Henness Road, Virginia City, Gould & Curry Mill, foot of 6 Mile Canon, Carson River, Reed's, Fort Churchill.

Returning: Fort Churchill, Virginia City, Gold Hill, Devil's Gate, Silver City, American Flat, top of Washoe mountains, foot of Washoe mountains, Washoe Lake, Washoe City, Galena, Stout's.

A barometrical reconnoisance was also made from Donner Lake, via the old Truckee emigrant trail, to the Henness Road at Sardine Valley, 16 miles.

A barometrical reconnoisance was also made, and observations taken, from Donner Lake up the Truckee river to Lake Bigler, 13 miles.

A barometrical reconnoisance was also made from the head of Donner Lake, via Castle Peak, to the line of our location at foot of Summit Valley, 8 miles.

A further reconnoisance was made from the terminus of our instrumental survey up the Twin Valley creek, into Twin Valley

and across by Castle Peak, into Lower end of Summit Valley, 15 miles.

Particular description of the Location adopted for First Division of Fifty Miles, via Antelope Route, to near the New England Mills; thence via Preliminary Survey to Eastern Boundary of California.

Commencing at the foot of K street in the city and county of Sacramento, where it intersects the water front of the Sacramento river, the line passes northerly and west of the City Water Works building, through what is known as Slater's Addition, for about fifteen hundred feet, thence crossing to the east it strikes the main North Levee at the intersection of Sixth with E street; thence it follows the line of North Levee for about three miles to a point near the old Muldrow House; thence curving to the left it passes across the space of low land lying between the levee and the American river, about half a mile in width, upon trestle bents averaging about fifteen feet in hight, and crosses the American river with two 192 feet spans of Howe's Truss Bridge; thence running straight over about one thousand feet of low land upon trestle bents, the line curves to the right into a direction of North 24° 30′ East, magnetic, and pursues its course in a straight line to about sixteen miles from Sacramento, across the Rancho del Paso, passing about one mile easterly from the Arcade House, crossing the north line of said ranch about one-half mile westerly from its northeast corner, and striking near the southwest corner of section 21, township 10, north Range 6, East, and crossing a corner of sections 16 and 15 to a point on the aforesaid section 15, distant about sixteen miles from the foot of K street in the City of Sacramento, at which point the line enters the county of Placer. Thence curving gently to the left, and reversing to the right again, it crosses Dry Creek with four 55 feet spans of bridge, and passes about 300 feet westerly of Dudley's house; thence curving gently to the right, it follows for about two miles along the foot of a light ridge in a direction parallel with Dry Creek and Secret Ravine, to the California Central Railroad, at a point known as Grider's, in section 2, Township 1, north Range 6, East. Thence running northerly for about one mile, the line curves to the right and crosses Antelope Creek with a 50 feet span, about 500 feet from its intersection with Secret Ravine, and attaining the top of the divide or ridge between Antelope and Secret Ravine, it follows the same, passing through sections 35, 36, 25 and 24 of Township 11, north Range 6, East, and sections 19, 18, 17, 8, 9 and 4

of Township 11, north Range 7, East, to what is known as the Big Reservoir, at the head of Red Ravine, a point distant about twenty-six miles from Sacramento, at which point commences the maximum grade of 105 feet per mile. Thence pursuing a northeasterly course, it continues along the top of said ridge or divide, crossing the main Antelope road at the flume known as Antelope divide, passing through sections 34, 27 and 26, of Township 12, north Range 7, East. Thence curving sharply to the right and reversing to the left, in about half a mile further it reaches the summit of the divide between Dutch Ravine and Secret Ravine, at a point known as the Caperton Flume, distant about three miles southeast from Gold Hill, in Placer county, and about four miles westerly from the Auburn Station—the terminus of the Sacramento, Placer and Nevada Railroad. Thence running a little north of east the line follows up said divide, crossing the main Auburn and Sacramento road to what is known as Newcastle Gap, in said ridge between Dutch Ravine and Secret Ravine, crossing said gap with an embankment 62 feet high, and passing through sections 26, 23 and 24 of Township 12, north Range 7, East, and section 19, Township 12, north Range 8, East—said point being distant 31 miles from Sacramento. Thence pursuing a general course of nearly due East, the line follows the south side of the hill of Dutch Ravine for about two miles, passing through sections 19, 20 and 21, of Township 12, north Range 8, East. Thence curving to the left the line crosses Dutch Ravine near its head, about $\frac{1}{4}$ mile below the Bloomer Ranch House, and crosses the divide between Dutch Ravine and Baltimore Ravine, passing along and near the Bear River Ditch to the main stage road between Auburn and Sacramento—being at said point distant about $\frac{1}{2}$ mile south of the town of Auburn, on section 15, Township 12, north Range 7, East—distant $34\frac{1}{2}$ miles from Sacramento. Thence curving to the left into a general northerly direction, the line follows near the top of the divide between the American river and Auburn Ravine, and near the Bear River Ditch, $\frac{1}{4}$ mile west from the Junction House, and through sections 15, 10, 3 and 2, of Township 12, north Range 7, East, and sections 34 and 35 of Township 13, north Range 7, East, to the head of Rock Creek, at which point the line reaches the summit of the divide between Dry Creek and the American river—distant about 39 miles from Sacramento. Thence pursuing a north-easterly course along the top of said ridge or divide, passing about $\frac{1}{8}$ mile south of Lovell's house and near the Cataract Mill, crossing through sections 35 and 25, of Township 13, north Range 8, East, and sections 19, 17 and 8, of Town-

ship 13, north Range 9, East, the line reaches the Clipper Gap, in section 19, at a point distant about 44 miles from Sacramento. Here, instead of following the top of the ridge further, it rising too rapidly for our grades, we curve to the right and run up the north side hill of Clipper Ravine (a tributary of the North Fork of the American), crossing several short, steep-side ravines to Wild Cat Summit. Passing through Wild Cat Summit (about ¼ mile south of Widow Hawes' house), we pass around Hawes' Hill, and curving to the left, cross the main road and pass up a smooth ravine to the top of the ridge at a point called Applegate Summit. A short distance further on, the line passes through Evergreen Gap, crossing the divide again at Baney's Gap, from which point it curves around in the side hill (on North Fork side) to Star House Gap, near the Star House. Here the line crosses the Star House Gap (and the traveled road) about 50 feet high, passing up very nearly on top of the divide to the head of Applegate Ravine, which runs into Bear river, this point being called New England Gap—distant about 50 miles from Sacramento. From New England Gap the line passes out upon the north side hill of North Fork; crossing the traveled or stage road, it runs along above the same, and about 500 feet above New England Mills; thence through the peach orchard of Murphy to Station 2,640, which point is about one mile north of the New England Mills, and the terminus of the 1st Division of 50 miles.

For a further description of the general line of road from this point to the Eastern boundary of the State, reference is had to a previous report of the Chief Engineer upon the preliminary survey, cost of construction, and estimated revenue of the Central Pacific Railroad of California, published October 1st, 1861, and subsequently re-published October 22d, 1862.

DESCRIPTION OF OTHER SURVEYS.

Clipper Gap, upon the top of ridge between the American river and Dry Creek, about 44 miles from Sacramento, being a point common to all the proposed lines from Sacramento, upon the Dutch Flat route, several lines have been surveyed and located for the purpose of determining the best, which are denominated as follows:

1st. Route via Auburn Station.
2d. Secret Ravine Route.
3d. Antelope Ravine Route.
4th. Doty's Ravine Route.
5th. Dry Creek Route.

The 1st, 2d, 3d, and 4th, of the above enumerated lines, have a common point at or near Auburn, the 5th at Clipper Gap.

1st.—ROUTE VIA AUBURN STATION.

This line pursues the direction already indicated from Sacramento to Dry Creek, about 16 miles; thence curving southerly it follows up the divide between Miner's Ravine and Strap Ravine; thence via Miner's Ravine it strikes the Sacramento, Placer and Nevada Raliroad at Wildwood, and continues upon south side of same to Auburn Station; from this point to Bloomer Divide near Auburn, two lines have been run and located, one upon an 80 feet grade to Newcastle Gap, and thence a 90 feet grade to Bloomer Divide, the other upon a 105 feet grade from Auburn Station to Bloomer Divide. Preliminary and location lines have been run upon both routes.

A line was also run and located from Dry Creek, via Grider's and Miner's Ravine, to Wildwood, but abandoned.

2d.—SECRET RAVINE ROUTE.

A line has been run upon this route, from Grider's to Auburn, but it was found impossible to attain the required elevation without using a higher grade than the maximum allowed by the Pacific Railroad Bill.

3d.—ANTELOPE RAVINE ROUTE.

This route has been fully described in the *particular* description of line, it saves 3¼ miles in distance over the Auburn Station line, and about 8½ miles over the Dry Creek line.

4th.—DOTY'S RAVINE LINE.

A line was run from McBowen's Ranch, on Dry Creek line, near Gold Hill, via Doty's Ravine, Doty's Flat, Ophir and Millertown, to Auburn, but it was found that it would be necessary to attain a higher elevation than the town of Auburn, which would require a grade higher than our maximum, and this line was therefore abandoned.

5th.—DRY CREEK LINE.

This line follows the present line of road to Grider's; thence runs near the present line of California Central Railroad to Lincoln; thence via Gold Hill and Virginia; thence via McBowen's Ranch, Sailors' Ravine, Moore's Bar, Sedgerst Summit, Taylor's Ravine, it reaches the south side hill of Dry Creek; thence following the same, it encounters and runs up Deadman's Ravine; thence crossing and running down the same, it continues up the

same via Page's, Redum's, Hawes' Store, Cook's, Watson's, Neilsburgh, Gassoway's and Predmoer's, to Clipper Gap.

Three lines of location, contingent upon this line, were run from Sacramento across to the line of the California Central Railroad.

"A"—Line striking at Leets.

"Ex"—Line striking at Pleasant Grove.

"B"—Line striking at Lincoln.

This line being 9 miles longer, and requiring the maximum grades with increased curvature, was finally abandoned. Experimental and location lines were run upon the Dry Creek lines.

MILES OF LINE RUN AND ESTIMATED BY THE ENGINEERING DEPARTMENT, FROM OCTOBER 1ST, 1860, TO OCTOBER 1ST, 1861.

Barometrical Reconnoisance.	*Miles.*
Barometrical Reconnoisance via Georgetown to Summit...	97
" " " Duch Flat to Fort Churchill	190
" " " Nevada and Henness Pass..	143
" " " Miscellaneous.....	50
Total Barometrical Reconnoisance.....	480

Preliminary Lines.	*Miles.*
Preliminary Line from Lincoln to Truckee River.....	102
" " " Gold Hill to Auburn.....	11
" " " Miscellaneous.....	5
Total Preliminary Lines.....	118

MILES OF LINE RUN AND ESTIMATED FROM OCTOBER 1ST, 1862, TO JULY 1ST, 1863.

Barometrical Reconnoisance.	*Miles.*
Via Yuba Gap.....	145
" Middle Feather River.....	160
Total Barometrical Reconnoisance.....	305

PRELIMINARY AND LOCATION LINES RUN.

		Preliminary.	*Location.*
1st.	Sacramento to Grider's.....	18	18
2d.	" " Leet's.....	18	18
3d.	" " Pleasant Grove.....	21	21
4th.	" " Lincoln.....	25	25

	Preliminary.	*Location.*
5th. Leet's to Grider's	3	3
6th. Lincoln to Clipper Gap	27	27
7th. Grider's to Bloomer Ranch	16	
8th. " " " "	16	16
9th. Grider's to Mildwood via Miner's Bar	7	7
10th. Grider's to Bloomer Divide	22	22
11th. Auburn Station to Bloomer Divide	21	21
12th. Auburn Station to Kelley's	2	2
13th. Sundry Preliminary—Auburn to Auburn Station	20	
14th. Wildwood to Auburn Station	6	6
15th. Auburn to Illinoistown	20	20
16th. Sundry Preliminary Lines	5	
17th. In Sacramento	6	3
Total	253	209

SUMMARY.

Or a Total of Barometrical Line	785	miles.
" " " Preliminary "	371	"
" " " Location	209	"
In all	1365	"

GRADES.

The following table shows the number of miles of each grade, upon the several routes, on the 1st Division of 50 miles.

TABLE OF GRADES

ON LOCATED LINES OF CENTRAL PACIFIC RAILROAD OF CALIFORNIA, FROM SACRAMENTO TO STATION 2,640.

Grade per Mile.	Antelope Line. MILES.	Auburn Line 80′ Gr. MILES.	Auburn Line 105′ Gr. MILES.	Dry Creek Line MILES.
0.5	.....	.....	.....	0.95
2.5	3.58	3.58	3.58	3.65
5	0.38	0.38	0.38	0.57
10	1.05	1.13	1.13	1.47
16	2.60	1.51	2.51	2.80
21	3.87	2.43	1.45	3.15
26	4.75	6.56	6.56	5.75
31	.....	1.05	1.05	0.75
35	.....	.....	.....	0.90
37	0.58	0.09	0.09	1.25
40	0.38	0.38	0.38	0.57
42	0.38	1.33	1.33	2.35
45	0.38	.....	.....	0.75
47	0.38	0.38	0.38	0.41
52	4.05	4.75	4.35	3.55
58	0.58	0.19	0.19	0.19
60	.....	.....	.....	0.35
63	1.04	3.50	3.30	0.19
68	0.20	0.19	0.38	0.66
74	0.20	0.85	0.85	0.25
78	0.98	.....	.....	.....
80	0.68	2.70	1.15	0.48
84	.....	2.84	.....	.....
88	0.17	0.17	0.17	0.17
90	2.60	5.07	2.58	8.18
105	11.89	6.11	10.45	7.85
∠	9.28	9.76	9.81	10.86
Total..	50.00	53.35	52.07	59.05

From the above table of grades it will be seen that while the adopted line has more miles of maximum grade, yet, taking the grades from 80 to 105 inclusive and it stands 15.35, 16.89, 14.35 and 16.68, while the distance to the same point by the different lines are 50 miles, 53.35, 52.07 and 59.05.

ALIGNMENT.

The following table shows the number of feet in length of the different curves and tangents, also the total number of miles of curved and straight line. Also the total amount of curvature in degrees, and also in circles of 360 degrees each, upon the first division of fifty miles of the Central Pacific Railroad:

TABLE OF CURVES

ON LOCATED LINES OF CENTRAL PACIFIC RAILROAD OF CALIFORNA, FROM SACRAMENTO TO STATION 2,640.

Radius of Curvature.	ANTELOPE LINE.		AUBURN LINE. 80′ Grade.		AUBURN LINE. 105′ Grade.		DRY CREEK LINE.	
Feet.	Distance. Feet.	Curvature. Degrees.	Distance. Feet.	Curvature. Degrees.	Distance. Feet.	Curvature. Degrees.	Distance. Feet.	Curvature. Degrees.
5,730	3,053	31	5,224	55	5,524	55	1,759	18
3,820	2,320	35	600	9	600	9	1,160	17
2,865	8,221	164	10,900	202	11,085	221	5,836	117
2,292	4,250	106						
1,910	3,016	90	8,367	251	8,397	252	6,866	206
1,637	2,102	74	2,102	74	2,102	74	2,102	74
1,432	12,398	496	12,097	484	14,655	586	19,547	782
1,146	4,632	202	7,172	359	4,002	200	10,842	542
1,075	83	4			83	4		
955	22,734	1,364	25,716	1,543	23,502	1,410	26,341	1,580
819	1,740	122	980	69	700	49	6,190	433
800	910	67	910	67	910	67	910	67
764	730	55	730	55	730	55	730	55
716	23,524	1,882	16,680	1,334	17,049	1,364	18,505	1,480
638	600	55	2,475	241	600	55	3,175	286
573	3,800	380	6,651	665	5,200	520	8,680	868
Straight Line.	170,486		181,583		179,800		199,140	
Total number of feet and degree of curv're	264,000	5,127	281,687	5,008	274,929	4,921	311,783	6,525

	ANTELOPE LINE. Number of Miles.	AUBURN LINE. 80′ Grade. Number of Miles.	AUBURN LINE. 105′ Grade. Number of Miles.	DRY CREEK LINE. Number of Miles.
Curved Line.	17.71	18.96	18.02	21.34
Straight Line.	32.29	34.39	34.05	37.71
Total number of Miles	50.00	53.35	52.07	59.05
Number of Circles.	14.2	15.0	13.7	18.1

ESTIMATES.

APPROXIMATE ESTIMATE OF THE TOTAL COST OF 1ST DIVISION OF 50 MILES OF CENTRAL PACIFIC RAILROAD OF CALIFORNIA.

Total cost of grading, masonry, bridging, ties, and track laying of Sections 1 to 18 inclusive, as per existing contracts	$400,000
Total cost of grading, masonry, bridging, ties, and track laying of Sections 19 to 50 inclusive, as per proposals received from contractors	1,835,896
Total cost of iron rails, locomotive engines, passenger, baggage and freight cars, turntables, switches and frogs, and machinery for machine shop	721,000
Total cost of buildings, machinery, right of way and engineering	175,000
Contingencies	89,600
Total cost of 1st. Division of 50 miles	$3,221,496

For detailed estimates of the above, as also the actual cost of grading, masonry, etc., already performed, you are respectfully referred to accompanying schedules, marked D, E and F.

SECOND DIVISION OF FIFTY MILES

Reaches to within 6 miles of the summit of the Sierra Nevadas.

A party, under the charge of S. S. Montague, Esq., are in the field making permanent location of the 2nd division. Ten miles, or to Long Ravine, are already located, and the balance will be completed during this fall, so that the 2nd division can be placed under contract by the 1st of December, 1863.

PROGRESS OF WORK OF CONSTRUCTION.

The work of construction was commenced by placing the grading, masonry, bridging, ties, and track laying of that portion of the work between the foot of K street, Sacramento, and the line of the California Central Railroad at Grider's (comprising sections 1 to 18 inclusive), under contract to C. Crocker & Co., December 27th, 1863.

This work was afterwards let by C. Crocker & Co., as follows:

From 6th Levee to end of Levee work (about 3 miles), to S. D. Smith.

From thence, the piling, trestling and bridging across the American river, to Baker & Hubbard.

From thence, sections 5 to 10 inclusive (about 6 miles), to S. D. Smith & Co.

From thence, sections 11 to 18 inclusive (about 8 miles), to Messrs. White & Gay.

Sections 7, 8, 9 and 10 were subsequently let by S. D. Smith & Co. to Charles Bates.

Sections 11 and 12 were let by White & Gay to John Coffee.

Part of section 15, section 16, and part of section 17, were let by White & Gay to Boyle & Mahon.

Part of section 17 and section 18 were let by White & Gay to Collins.

At present date, the levee is completed from the intersection of E and 6th streets to the point of leaving the levee near Tivoli, and ready for laying track.

The lumber for the American River Bridge has been delivered, the bridge framed, and the foundation of north pier completed, ready for raising the pier.

The coffer dam around center pier is driven, and only the capping of piles remains to complete the foundation.

The foundation of south pier is completed, and the timber pier is in process of construction.

The lumber for piers has partly arrived, and the balance is on its way.

Nearly all the lumber for the trestling has arrived, and about two-thirds of the same is framed.

Sections 5 to 10 inclusive, are completed, and ready for laying track.

Sections 11 to 16 inclusive, will be completed by the latter part of August.

Sections 17 and 18 having been delayed until the line of per-

manent road eastwardly was adopted, they will not be completed as soon as the others, but will be finished so as to cause no delay to the track laying.

CHARACTER OF MATERIAL.

The cost of grading the first 18 miles has been somewhat enhanced, in consequence of encountering a larger proportion of hard material than was at first anticipated; over one-third of the whole quantity of material excavated up to the present time being cement, costing more than double the price paid for excavating earth.

Also, from the fact that this hard material underlies the earth, on most of the line from the American river eastwardly, at from 1 to 2 feet only, below the surface, rendering it difficult to find borrowing material for embankments without excavating over a considerable area of surface.

Also, from the fact that the experience of this season in high water at the bridge across the American river, has demonstrated that it is necessary, in order to render the piers secure beyond a contingency, that they should be filled around pretty extensively with cobble stone which is now being done.

CULVERTS

Were originally intended to be built of stone, but in consequence of the distance which the stone had to be hauled, and therefore their increased cost, culverts of brick were substituted.

The total number of culverts on sections 1 to 18 inclusive, is 36, of which 26 are completed, there are three in process of construction, and 7 remaining to be completed.

These culverts are barrel and arch culverts—the largest being 8 feet span.

They are built of hard burned brick, in a substantial and workmanlike manner, the parapet walls will be coped with cut granite, of 8 inches in thickness, securely fastened to the walls with iron anchors.

TRESTLING.

There are two heavy pieces of trestling on the first division, requiring 283,000 feet, board measure, of timber, and about 800 redwood piles from 12 to 30 feet in length. This trestling has been planned with a view to strength, safety and durability; the ties, stringers, corbels and caps being of best quality of Puget Sound pine, and the posts, braces, sills and piles of coast or black redwood, from Santa Cruz.

THE PLAN OF TRESTLING

Is simple in its details, consisting of two perpendicular main posts twelve inches square let into a 12 by 12 inch sill, with mortise and tenon directly under the bearing of the track stringers. Two brace posts, 10 by 12 inches, extend down on either side of the main posts (with a run of one foot in three) into the sill, to which they are also secured, and are bolted at the top to the main posts with inch iron bolts and heavy cast iron washers, the sills resting on four piles of redwood timber, which are let into the sill with mortise and tenon. The piles are driven so as to come directly under each post and also under the lower end of the main post braces. The posts are capped with a timber 12 inches square and 9 feet long, into which the posts are tenoned and pinned. Upon the caps rest the corbels, 12 inches square and 9 feet long. Upon these corbels are laid the stringers, 12 by 15 inches and 15 feet long, which are secured by two-inch iron bolts at each end, passing down through either ends of stringers and corbels. The caps are notched one inch to receive the corbels.

Upon the stringers rest the cross-ties, 3 by 8 inches and 8 feet long, securely spiked down to the stringers. Upon these cross-ties the rail is laid and secured in the usual manner. The bents are placed at intervals of 15 feet from center to center.

THE TRESTLING AT SOUTH SIDE OF AMERICAN RIVER BRIDGE

Is 2,200 feet in length, commencing at the levee a short distance above the Tivoli House, and consists of 151 bents, from 8 to 17 feet in hight. Short bents at the end of trestling join it to the levee embankment, making a thorough connection with the same. Most of these bents are framed and upwards of 100 piles already driven.

THE TRESTLING AT NORTH END OF AMERICAN RIVER BRIDGE

Is 615 feet long, and composed of 42 bents from 9 to 18 feet in hight. It is similar in character to that on the south side of the river. The foundations of trestling are all of piles.

AMERICAN RIVER BRIDGE

Is planned upon the principle of the Howe Bridge, crossing the American river in two spans of 192 feet each in the clear, with an elevation above the highest water of 6 feet in the clear.

The piers, for present purposes, will be built of timber, and so constructed as to allow stone piers to be built within them. The details and dimensions of its parts have been planned to correspond with its importance, and no considerations of economy have been allowed to interfere with a perfect and thorough combination of strength and durability. It contains 183,000 feet, board measure, of timber; 44 tons of iron bolts and washers, and weighs about 400 tons, which, with 375 tons (the greatest load to which it can ever be subjected), gives 775 tons as the whole weight of structure and load, one-half of which, or 388 tons, is supported by each span. The total length is 397 feet; hight of truss, 24 feet; width of truss from out to out, 18 feet 8 inches; width of truss in clear, 13 feet. It has two bottom chords, consisting of six pieces each, two of which are 5½ by 16 inches, and four are 4½ by 16 inches, with an intermediate space of 1 inch, admitting the main tension bolts, giving an aggregate cross section of lower chord of 896 square inches. There are also corbels at either end of each span, with a cross-section of 792 square inches, the corbels extending 22 feet from either end of chords and resting on four wall plates, 10 by 12 inches. The upper chords also consist of six pieces of the same width as the lower chords, 12 inches deep, with a center rib of 6 inches in depth extending over six panels and firmly bolted to the upper chord, giving an aggregate cross-section of 1,008 square inches. All the chords are framed. The dimensions of the main braces at the ends of each span are 10 by 12 inches, diminishing in size towards the center. The counter braces at the ends of the bridge are 8 by 12, which also diminish towards the center. The largest main tension bolt is 2 inches in diameter, diminishing to 1½ inches at the center. The angle blocks, of cast iron, are all cast to a length corresponding to the total width of chords, with a face equal to the size of the ends of the braces, which are secured in their places by flanges. There are also three iron tubes or boxes, of the same length as the depth of the chords, through which the tension rods pass.

All the iron for this bridge is now delivered.

THE FOUNDATIONS OF PIERS AND ABUTMENTS OF AMERICAN RIVER BRIDGE

Are of redwood piling, driven at intervals of 2 feet from center to center. It was necessary, in the middle pier, to use iron shoes, to drive the piles to the required depth, the hard bottom being composed of boulders. The piles are tenoned and capped with timbers 12 inches square, upon which are laid longitudinal timbers of the same dimensions as the caps, one foot apart, and

secured by drift bolts. On these timbers a solid flooring of 10 by 12 inch timbers is laid, projecting one foot beyond the footing course of the intended masonry. There are 370 piles in the foundations, of about 30 feet in length.

THE MASONRY IN PIERS AND ABUTMENTS OF AMERICAN RIVER BRIDGE

Will be of the best description of hammer-dressed masonry, with rock face, laid in regular courses, with stone of uniform thickness, of the best quality. The stone will conform to a plan so arranged as to break joints as well in the center as the face of the wall. The stone will be dressed to their proper dimensions before being brought on the wall, and no work will be allowed on the wall to the injury of the stone already laid. The coping will be laid with broad stone, dressed down to an even surface, to receive the wall plates. The cement will be of the best hydraulic cement, in the proportion of one of cement to two of clear, sharp sand.

BRIDGE AT DRY CREEK

Is planned upon the principle of the Burr bridge, which experience has proved to be well adapted for short spans.

This bridge is built in 4 spans, of 54½ feet each, from center to center of pier, making a total length of 218 feet. It is connected with the embankment at each end by shore bents, the stringers extending to the bank in the same manner as described in the trestle work at Arcade Creek.

This will be a *deck* bridge, the cars running upon the top of the same.

Each of the *chords* of each span are composed of two lengths of timber reaching from center to center of pier, 54½ feet long, 8 inches thick, and 12 inches high, placed five inches apart, between which are placed the posts 10 feet long, 12 by 12 inches, notched so as to pass between the *chords*, at intervals of 6½ feet. Main braces, 6 by 12 inches, extend from bottom to top of posts.

Upon the upper chords rest floor beams, 10½ feet in length, 6 by 12 inches, at intervals of about 2 feet from center to center.

Upon the floor beams are placed track stringers, 10 by 12 inches.

Upon the track stringers rest sawed cross ties, 8 feet long, 3 by 8 inches, at intervals of two feet from center to center.

The iron rail is firmly spiked on to these cross ties.

The chords are securely bolted together by 288 five-eighth bolts in each span, with 576 cast washers.

The lower chords rest upon corbels or bolsters, over each pier, 13 feet long, 20 inches wide, and 12 inches high, securely bolted on to the chords with $\frac{3}{4}$ inch bolts.

Length of span from center to center							54½	feet.	
Cross section of upper chords at						Center	384	square	inches.
"	"	"	"	"	"	Ends	384	"	"
"	"	"	lower chords	"		Center	384	"	"
"	"	"	"	"	"	Ends	384	"	"
"	"	"	corbels				240	"	"
Hight of truss from top of upper to bottom of lower chord							11	feet	
Hight of truss inside of chords							9	"	
Width of truss from out to out of chords							10	"	6 inches.
Width of truss inside of chords							6	"	6 "

There will be 306 cubic yards of rubble bridge masonry in the 5 piers, laid in cement.

STONE PIERS

Will be of rubble masonry, the stone to be of good quality. The corner stones and coping will be dimension stone, with dressed beds and joints, and rock face, an arras of one inch to be cut on the angles or corners, true to the batter marked on the plan.

The body of the work will be laid of stone of large size and regular courses, the whole thoroughly bonded with the proper proportion of headers and stretchers, and will in all cases be so scabble pointed, or otherwise dressed, with joints not exceeding an inch in width, as to have a good general bearing upon each other without the aid of chips, pinners or anything that may be removed or cracked; and no chips or pinners will be put into the face of the work. The tops of the walls to be dressed with coping stone of even thickness, so leveled and dressed as to give a uniform and substantial bearing to the wall plates.

FOUNDATIONS.

The pits for foundations will be excavated to hard bottom, leveled off and the footing course laid, thereby doing away with timber in the foundations; the line of hard bottom is from six to twelve feet below the surface of the ground.

ARCADE CREEK TRESTLING

Is 220 feet in length, and consists of 14 bents, placed at intervals of 15 feet. The bents are placed at an angle of 45 de-

grees with the line of road, that being the general course of the creek at the point which we cross.

PLAN OF TRESTLING AT ARCADE CREEK

Is similar to that of the American river, excepting the foundations, which are of plank 3 inches in thickness, and 5 feet in length, laid at right angels to the bents. The foundations are excavated down to solid material, upon which plank are laid as above described. The end bents are connected with the bank by stringers, extending 13 feet beyond the end of same, resting on the bank sills firmly embedded in the embankment.

The timber is framed and will be ready for raising in a few days, making a completed road-bed from the American river to section 12.

In this structure there is 20,000 feet, board measure, of timber, and 800 lbs. of iron.

CROSS TIES

Are of redwood, the joint ties being 6 by 10 inches, and 8 feet long; the intermediate ties being 6 by 8 inches, and 8 feet long; 68,000 ties are under contract, 4,000 are delivered at Sacramento, and the balance to be delivered so that the work of track laying may progress uninterruptedly.

IRON.

Six thousand tons, or over 60 miles, have been purchased, contracted to be delivered at the rate of 500 tons per month. A considerable portion of this iron has been shipped, and is on its way to California.

The spikes and chairs necessary to complete 60 miles, have been purchased, and are being sent forward.

LOCOMOTIVES.

The following locomotives have been purchased in the Atlantic States, for the 1st Division of 50 miles:

Of William Mason & Co., Taunton, Massachusetts.

1 locomotive, 15 by 22 inch cylinders.
1 locomotive, 16 by 24 inch cylinders.
1 locomotive, 17 by 25 inch cylinders.

Of Norris & Co., Philadelphia.

1 locomotive, 15 by 22 inch cylinders.

Of Danforth, Cook & Co., Patterson, New Jersey.

2 tank locomotives. In all 6 locomotives.

PASSENGER CARS.

Six first class passenger cars have been purchased of Mason & Co., of Springfield; also, 2 baggage cars; also, 25 platform freight cars; also, 15 box freight cars; also, frogs, switches, turn-tables, etc., necessary for the first 50 miles.

Proposals have been invited and received for the grading and masonry, etc., of the remaining portion of the 1st Division.

Twenty-three bids were received, a number of which, from responsible parties, will range within my approximate estimate of the cost of grading, masonry, bridging, etc., for this portion of the work.

Sections 19 to 31 inclusive, or from the line of the California Central Railroad to Newcastle Gap, have been let to responsible contractors, and will be commenced immediately.

I would advise, that for present purposes, we follow the line of 6th and I street to Front, leaving the heavy work between 6th and E streets and the Water Works Building, to be performed next Summer.

I would also remind the Board, that in order to preserve the charter granted us by the Territory of Nevada, it will be necessary to make a survey of the line in Nevada this year. I respectfully ask action upon it.

I also invite your attention to a previous report, giving the dates at which it will be necessary to place the 2d and 3d Divisions under contract, in order to complete the same within the time required by Act of Congress.

Accompanying this Report will be found in document "A," a printed form of general contract for grading, masonry, bridging, etc., containing the stipulations required by San Francisco, Sacramento and Placer counties; also, by the By-Laws of this Company in regard to liabilities of the counties and stockholders; also, printed document "B"—general specifications of the manner of executing the work of grading, etc.; also, printed document "C"—a form of release for right of way, etc.

I would also invite your attention to 48 specimens of rock from different localities, upon sections 22 to 50, showing the character of the material in cuts upon the work to be put under contract upon 1st Division; also, *seven specimens of gold, silver and copper ore*, from the vicinity of the line; also to two specimens of iron ore, one of asbestos, and one of soap-stone from the vicinity of the line.

Respectfully submitted,

THEODORE D. JUDAH,

Chief Engineer Central Pacific Railroad.

July 1st 1863

№ 6.

REPORT

OF THE

CHIEF ENGINEER

UPON

RECENT SURVEYS,

PROGRESS OF CONSTRUCTION,

AND

ESTIMATED REVENUE

OF THE

CENTRAL PACIFIC RAILROAD

OF CALIFORNIA.

DECEMBER, 1864.

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Montague Dam.5

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DECEMBER, 1864.

OFFICERS

OF THE

CENTRAL PACIFIC RAILROAD COMPANY OF CALIFORNIA.

PRESIDENT,

LELAND STANFORD.

VICE PRESIDENT,

C. P. HUNTINGTON

TREASURER,

MARK HOPKINS.

SECRETARY,

E. H. MILLER, JR.

GENERAL SUPERINTENDENT,

CHARLES CROCKER.

ACTING CHIEF ENGINEER,

S. S. MONTAGUE.

ATTORNEY,

E. B. CROCKER.

DIRECTORS,

LELAND STANFORD, Sacramento.
C. P. HUNTINGTON, Sacramento.
MARK HOPKINS, Sacramento.
E. B. CROCKER, Sacramento.
E. H. MILLER, JR., Sacramento.
A. P. STANFORD, San Francisco.
CHARLES MARSH, Nevada.

ENGINEER'S OFFICE, C. P. R. R. OF CAL.,
SACRAMENTO, OCTOBER 8th, 1864.

To the President and Directors of the
Central Pacific Railroad Company of California:

GENTLEMEN—I present herewith a report upon the progress of the surveys, work of construction, and equipment of your Road to the present date; and also an estimate of the business and Revenue of the Road when completed to Stout's Crossing of Truckee River—a distance of one hundred and fifty-five miles from Sacramento.

As the Report of your Chief Engineer, the late T. D. Judah, Esq., made in July, 1863, contained a detailed description of the several lines surveyed up to that time, I have deemed it unnecessary to embody a similar description in this Report.

I append, however, a few notes of the general topographical features of the country over which the line passes, and also notes of such surveys as have been made since the date referred to.

The practicability of a railroad route across the Sierras, was for many years a question of serious doubt, even among the warmest advocates of a Pacific Railroad; and previous to the surveys made by Mr. Judah, in 1861, under the auspices of your Company, but little reliable information on the subject had been placed before the public.

The result of this survey was the development of a feasible line for a railroad, with maximum grades of one hundred and five (105) feet per mile.

Before commencing the survey, careful and extended examinations were made of five of the most prominent routes across the mountains, distances measured, and the altitudes of the different "Passes" ascertained by barometrical observations. The conclusions based upon these examinations were fully confirmed by the subsequent instrumental survey, made, as before stated, in 1861.

Before the final adoption of this route for the location of your road, still further explorations and examinations were made, but without satisfactory results, save the evidence afforded that the route selected for the experimental survey was beyond question the best, if not indeed the only practicable route for a rail-

road across the mountains; and it is gratifying to be able to state, that as far as the location survey has been extended, its entire practicability has been fully proven.

The Pass selected is believed to be the lowest of any across the Sierras, which are attainable by a practicable railroad line. In fact, I think that upon no other route (with perhaps one exception,) has a continuous line of levels been carried from tide water to the Summit, and I am not aware of the result of that survey having been placed before the public.

The route selected for your Road is the most direct in its general course of any proposed across the mountains—the distance from the city of Sacramento to the foot of the maximum grade upon the Eastern Slope being but 118 miles, which is much less than a corresponding point can be reached by any other route.

A careful examination of the map of Central California, will convince any one of the many important advantages of location which your Road possesses. Following one of the main spurs of the Sierras, which forms the Divide between the waters of Bear river and the Yubas on the north, and the American river on the south, the crossing of the deep cañons formed by those streams is entirely avoided, and you are enabled to make the ascent of the Western Slope of the mountains, attaining an altitude of 7,000 feet *without any loss of grade*, beyond the first eighteen miles.

Another important feature of your route is, that the *Second Summit* of the Sierras is avoided. As can be seen by reference to the map, that portion of the Sierras lying between latitude 38° 30′ and 41° north, consists of two parallel ranges of nearly equal altitude, enclosing an immense basin from ten to thirty miles in width. Lake Tahoe, which is the great reservoir for the waters of the upper or southern end of this basin, finds its outlet through the Truckee river, to which Mr. Judah, in his Report of 1862, refers as follows:

"Running at first northeasterly about eight miles, thence northerly about ten, and thence northeasterly about twelve miles, the Truckee passes down between these two summits, with a nearly uniform fall of about thirty-five feet per mile; thence sweeping round to the eastward, it passes *through* the second range or summit at a depression where it seems to be entirely worn away down to the level of the river; thence pursuing its way through an extensive plain, known as the Truckee Meadows; thence through the Washoe mountains to the Big Bend; thence northerly about twenty miles, finds its way into Pyramid Lake.

"At the Donner Lake Pass, sometimes called the 'Truckee Pass,' where our line crosses the first Summit of the Sierra

Nevada, the altitude of the line is about 1,200 feet above the Truckee river.

"Donner Lake lies immediately beneath at a depth of 1,100 feet. Two long ranges or spurs enclose the lake and its valley, declining in hight gradually to the Truckee river, about eight miles below. Our line is carried down along the side-hill of the spur or range immediately above the lake and upon its south side, to the Truckee river, which point it reaches in a distance of eleven and a half miles of line, with a uniformly descending grade of 105 feet per mile from the Summit.

"The Truckee thus reached, all further difficulty of location ceases, as it pierces its way through all obstructions, with a uniform descent of not over forty feet per mile, to the Humboldt Desert, which forms the Sink of the Humboldt and Carson rivers.

"*Thus the Second Summit of the Sierras, and the crossing of the Washoe mountains, are entirely avoided*, and from the western base to the Summit of the Sierra Nevada, the grade is uniformly ascending or level (there being no descending grade going eastward); while from the Summit to the Big Bend of Truckee, or Humboldt Desert, a continuous descending grade is maintained."

These important advantages of location will not be underrated by those who are conversant with the difficulties attending the construction and working of mountain roads.

By avoiding the Second Summit of the Sierras and Washoe mountains, you are not only enabled to save the grades required to overcome those ranges, but also encounter a much narrower snow-belt—the eastern limit of deep snow upon this line being the Truckee river, at a distance of but twelve miles from the Summit.

GRADIENTS.

The objection which has been so often urged against the successful operation of a railroad across the Sierras, viz: the heavy gradients to be overcome, has been so fully answered in the previous reports of your Chief Engineer, that it is unnecessary to discuss the matter at length here.

With the practical examples furnished by the Baltimore and Ohio, the Virginia Central, and other important roads in the Eastern States and Europe which might be cited, the question of the successful working of a railroad with gradients of 105 feet per mile, is neither doubtful or problematical. Upon that portion of your Road which is already completed, there occur four and one-half consecutive miles of maximum grade of 105 feet per mile, over which for more than four months, six trains have passed daily without accident or detention—the passenger trains

making a speed fully equal to the average speed of express trains on Eastern roads. The operating of a road of this character is of course more expensive than where lighter gradients can be obtained.

Besides requiring a superior class of machinery, an additional item of expense will be found in the increased consumption of fuel; yet the abundant supply of this article in the immediate vicinity of your Road, and the low price at which the same can be delivered, viz: from $2 50 to $3 00 per cord, renders this a less important item than would otherwise appear.

The maximum grade, which according to the Act of Congress, passed July 1st, 1862, you are allowed to use in the construction of your road, is one hundred and sixteen (116) feet per mile; the adopted maximum is, however, one hundred and five (105) feet, and at no point will it be necessary to exceed this grade. The location of the only portion of the line upon which the preliminary surveys indicated the necessity of using a higher grade than 105 feet, has already been accomplished with a grade of less than eighty feet per mile, and as *the levels have been carefully tested from tide water to the Summit*, the practicability of constructing your road upon the adopted maximum, is fully demonstrated.

A table of grades from Sacramento to the end of the located line, is appended, by which it will be seen that the location thus far has been made with a less distance of maximum grade than was contemplated by the original survey.

ALIGNMENT.

Although by the Act of Congress already referred to, you are allowed to use the maximum curves used on the Baltimore and Ohio Railroad, the adopted maximum is 10°, or a radius of 573 feet. But two curves of this radius, (with the exception of the curves used on temporary tracks in the City of Sacramento,) occur on the first division, and at those points the grade is comparatively light. It has been necessary in but few instances to introduce maximum curves upon maximum grades, and the alignment will be found to be more favorable than was originally anticipated.

By reference to the appended tabular statement of the alignment, it will be seen that more than sixty per cent. of the first division is *tangent* or straight line, while of the eight succeeding miles, in the very "heart of the mountains," more than twenty per cent. is *tangent* line.

This will, I think, bear a favorable comparison with the alignment of other roads constructed through mountainous regions.

FIRST DIVISION OF FIFTY MILES.

For a general description of the located line of this division I would respectfully refer you to the report of your Chief Engineer, made July, 1863.

No changes were made in the line between Sacramento and Newcastle, but from the thirty-first to the forty-eighth section almost an entire relocation has been made, resulting in a material reduction in the cost of the work, and several important improvements in the alignment on Sections 35 and 43; the changes being made (with the exception of a single instance) without any increase of grade.

The most important changes were upon the line through Dutch Ravine (Sections 32—3—4—5), from Lime Point to the head of Rock Creek (Sections 38 to 40, inclusive), through Clipper Ravine to Wild Cat (Sections 44 and 45), and at Baney's Ranch, by which the contemplated tunnel at that point is avoided, reducing the cost of a single section (47) more than $70,000.

By the present location no tunneling will be required on the first division.

WORK OF CONSTRUCTION.

As no portion of your Road was fully completed at the date of the last report of your Chief Engineer, it may not be inappropriate to refer here to the progress and manner of construction of the first division.

That portion of your Road lying between the foot of K street, in the City of Sacramento, and the California Central Railroad, comprising Sections 1 to 18, inclusive, was placed under contract to Charles Crocker & Co., December 27, 1862, but active operations were not commenced until the month of February following, from which time the work steadily and rapidly progressed, and on the 29th day of February, 1864, their contract was fully completed, and the road ready for business from Sacramento to the junction with the California Central Railroad.

The second subdivision of the first division, comprising Sections 19 to 31, inclusive, was let in July, 1863, as follows:

Sections 19 and 20 to Cyrus Collins & Bro.; Sections 21, 22, 23 and 24 to Messrs. Turton, Knox & Ryan; Sections 25, 26 and 27 to Charles D. Bates & Co.; Sections 28 and 29 to S. D. Smith; and Sections 30 and 31 to Charles Crocker. The work on this portion of the line was fully completed, the track laid and the Road opened to Newcastle on the 6th day of June last.

The Road has been constructed in the most permanent and

durable manner, and the general character of the work will compare favorably with first-class railroad work in the Eastern States.

The bridge across the American river is the largest and most substantial structure of the kind in the State, comprising two spans of Howe's truss, of 192 feet each in the clear, with approaches of trestling, resting on pile foundations, of 2,400 feet in length on the south, and 600 feet on the north side of the river, making a total length of bridging of 3,400 feet.

The foundations of the piers are of piles, which are tenoned and capped with timbers twelve inches square, upon which are laid longitudinal timbers of the same dimensions as the caps, one foot apart and secured by bolts.

On these timbers a solid flooring of ten by twelve inches is laid, projecting one foot beyond the footing course of the intended masonry.

One hundred and twenty-three piles, from 25 to 35 feet in length, were used in the foundation of each pier.

As a security against the action of floods, several hundred yards of cobbles were placed around the foundations of each pier, filling the space between and around the piles, inside the coffer dam, up to low water mark. In addition to this, about sixty car loads of granite have recently been placed around the piers, in such a manner as is believed will render them perfectly secure from all action of high water.

The trestling at Arcade creek, is 200 feet in length, and similar in plan to that at the American river.

THE BRIDGE AT DRY CREEK

Consists of four spans of Burr's truss, of 54½ feet each, resting on stone piers, and connected with the embankment at each end by shore bents of trestling.

THE ANTELOPE CREEK BRIDGE

Consists of one span of Burr's truss, resting upon substantial granite piers.

The above are all the wooden structures that occur upon the first thirty-one miles of your road, and for full details respecting them, reference is made to the above mentioned Report of your Chief Engineer for 1863.

THE CULVERTS

On Sections 1 to 18, inclusive, thirty-six in number, are built in a thorough and substantial manner, of hard-burned brick, laid in

hydraulic cement, with parapet walls, coped with granite six inches in thickness, securely fastened to the walls with iron anchors.

On Sections 19 to 31 inclusive, the culverts are built exclusively of granite, with paving of the same material.

THE TIES

Furnished by the contractors are of the best quality of *Coast* or *black* redwood, and there are now delivered, in addition to those already used, a sufficient number to lay twenty-two miles of track.

THE TRACK

Has been laid in a thorough and workmanlike manner, and is ballasted with such material as could be obtained in the vicinity of the Road. The material composing the road bed on Sections 19 to 31, forms of itself an excellent ballast, being for the most part a decomposed granite, which, while forming an excellent support for the superstructure, is sufficiently porous to prevent the collection of water on the road bed.

Portions of the track, especially through the cement and clay cuts on the plains, will probably require a better quality of ballast than has yet been provided. Excellent material for this purpose can be obtained near the confluence of Secret and Miner's ravines, and within one-half mile of the road.

The cost of grading a track to the point named will be but trifling, and I would recommend its construction at an early day.

Good ballasting is found at various points on the line, and besides the inexhaustible quantities of decomposed granite already alluded to, extensive deposits of gravel, and various kinds of disintegrated rock are met with at convenient intervals, so that an adequate supply of ballasting can always be obtained.

BUILDINGS.

Commodious freight and passenger depots have been erected at Sacramento and Newcastle, and at the former place an Engine house, with stalls for five engines has also been built.

Turn-tables have been built at both named places, and a **Y** track constructed at the Junction. Suitable watering places have also been provided at Sacramento, Junction and Pino.

A Fairbank's track scale of a capacity of sixty tons, has been landed from the ship, and will soon be erected at the Junction.

A TELEGRAPH LINE

Has also been constructed along the line of your Road, from Sacramento to Newcastle, and offices established at both named places.

It may not be improper to state in this connection, that the Commissioners appointed by the President of the United States in accordance with the provisions of Section 4, of the Pacific Railroad Act, have made a careful and thorough examination of your Road and the Telegraph Line connected therewith, and their favorable report has already been transmitted to the proper authorities at Washington.

ROLLING STOCK.

There have been purchased for use upon the first division, and are now in daily use upon the Road, 5 Locomotives; 6 First-Class Passenger cars; 2 Baggage cars; 25 Box Freight cars; and 25 Platform cars.

In addition to which there have been received one heavy Freight Locomotive, and 20 Freight cars not yet put together.

There have been purchased and shipped—4 First-Class Passenger cars; 2 Mail and Express cars; 24 Freight cars; 20 Dump (or Gravel) cars.

Two more heavy Freight Locomotives have been contracted for with Messrs. Danforth, Cook & Co., of Patterson, N. J., and are now in course of construction. Extra axles, car wheels, locomotive tires, etc., have been purchased and shipped.

The following table shows the size, weight, etc., of the engines now in use upon the road:

NAMES OF ENGINES.	Wg't of Engines, Tender with wood and water—Tons.	No. of Drivers.	Diam. of Drivers—feet.	Diam. of Cylinders—Inches.	Length of Stroke.	NAMES OF BUILDERS.	REMARKS.
Gov. Stanford.	46	4	4½	15	22	Norris & Son.....	
Pacific.....	47½	4	5	16	24	Wm. Mason & Co.....	
Atlantic.....	47	4	5	15	22	Wm. Mason & Co.....	
John Conness...	50	6	4	17	25	Wm. Mason & Co.....	Just received.
T. D. Judah.....	18	2	4½	11	15	Danforth, Cook & Co...	Tank Engine.
C.P.Huntington	18	2	4½	11	15	Danforth, Cook & Co...	Tank Engine.
———	—	6	4	—	—	Danforth, Cook & Co...	Now being
———	—	6	4	—	—	Danforth, Cook & Co...	constructed.

The rolling stock is all of the best class used on eastern roads. The locomotives, with one exception, were built to order, and have thus far given perfect satisfaction. Those now under construction are designed particularly for service on heavy grades.

CONSTRUCTION OF THIRD SUB-DIVISION.

The work of grading above Newcastle was commenced in April last, and has been steadily progressing since that time.

The cut through Bloomer Divide, which is the heaviest cut on the First Division, being 63 feet in depth, and 800 feet in length, through a hard indurated gravel, is now fully completed, and the grading on other portions of the line is in a favorable state of progress.

The culverts are built of the very best quality of granite, which is found in great abundance in convenient proximity to the work.

All of the unfinished work between Newcastle and Clipper Gap, a distance of twelve miles, is of such a character as to admit of its rapid prosecution, and the work upon this portion of the line can easily be completed within four months.

TRESTLING.

As much of the heavy work on your Road (as has been noticed in former reports), occurs in crossing the depressions or gaps in the Divide along which the line runs, it has been deemed expedient in some instances to substitute trestling for embankments.

Trestling, properly constructed of Puget Sound pine and redwood, will last from eight to ten years, and can then be replaced with embankments, by transporting the material on the cars, at much less than the present cost.

At Newcastle Gap, Lovell's Gap, and at two points near Clipper Gap, trestling has been designed, and timber for the structure at the former place, is now arriving.

SECOND DIVISION.

The work of location on this Division was commenced in July, 1863, but owing to the extremely rugged character of the country, the progress of the survey was necessarily slow, and but about eighteen and a half miles of permanent location were made. New experimental lines were run some eight miles further, and the preliminary location had been commenced, when owing to the lateness of the season, the party was withdrawn from the field.

The greatest difficulty encountered in the work of location, is that of maintaining a continuous ascending grade, which, were it possible to accomplish, the maximum grade from the foot hills to the Summit of the Sierras, could be reduced below 80 feet per mile; but as the frequent depressions or gaps in the Divide, along which the line passes, render a continuous grade impracticable,

they necessarily become commanding points in the problem of location.

Thus, in order to pass the Illinoistown and Long Ravine Gaps, we are compelled to maintain, for nearly eight miles, a very light average, and in many places a level grade, making in that distance an altitude of but 115 feet, while immediately following is a section of three and a half miles of maximum grade.

From the commencement of the second division, the line passes along near, and frequently upon, the summit of the Divide, about two miles, to the Lower Illinoistown Gap; thence along the American River slope for about one-half mile, when it recrosses the Divide through Bear River Gap, (where a tunnel 500 feet in length will be required,) and thence follows the Bear River slope of the Divide three and a half miles to Long Ravine. Some heavy work occurs on this portion of the line, but with the exception of the tunnel referred to, will not exceed the average of the work on the last five miles of the first division. The succeeding nine miles from Long Ravine to Gold Run, comprises some of the most formidable work encountered upon the Western slope of the mountains. Crossing Long Ravine at a hight of one hundred and fifteen feet, the line curves sharply to the right, and passes with a maximum grade along the steep, and in many places precipitous side hill of Rice's Ravine, crossing a sucession of short, steep side ravines and gulches, and intervening spurs, to Cape Horn; which is a precipitous, rocky bluff, about twelve hundred feet in hight above the American river.

The construction of the Road around this point will involve much heavy work, though the material encountered is not of a very formidable character, being a soft friable slate, which yields readily to the pick or bar.

The dip of the ledge is about seventy-five degrees, or nearly perpendicular; but as our line at this point crosses the line of stratification nearly at right angles, the cuttings will admit of a much steeper slope than can be generally adopted for that class of material.

The road around this bluff will necessarily be mostly in excavation, as the construction of an embankment, even with a heavy retaining wall, would in many places be unsafe if not impracticable. Passing around the face of this bluff, with an aggregate curvature, in one direction, of one hundred and eighty-six degrees, the line enters Robbers' Ravine, the western slope of which it follows for about one and a half miles to Oak Summit, at the point where the old pack trail crosses the same.

Passing thence via Trail Summit, and along the side-hill above the North Fork of the American river, encountering a number of abrupt, deep ravines (some of which it will probably be ne-

cessary to cross temporarily on trestling), the line enters Secret Ravine, which it follows for about three-fourths of a mile, and thence follows a tributary of the same to its source, near the Illinoistown and Dutch Flat stage road, about one and a half miles east of Madden's toll house. Thence the line runs near the stage road to Secret-town Gap, which it crosses at the hight of fifty-five feet. The crest of the ridge, or divide (between the American and Bear rivers), is here so narrow as to barely admit of the construction of trestle work, and the sinuous course of the line precludes the possibility of using any other kind of wooden structure.

Trestling, strongly and substantially built of the best mountain timber, red fir, sugar pine, or tamarack, can safely be depended upon for five or six years, and in the meantime, with the facilities for transportation of material which your road will afford, such structures can be replaced either with embankments or stone viaducts, as may be deemed most advisable.

From Secret-town Gap to Gold Run, a distance of two and a half miles, the line passes around the northern or Bear river slope of Cold Spring mountain, encountering a succession of deep, abrupt ravines, where some of the heaviest work on this division occurs.

One tunnel of about three hundred feet in length will be required on this portion of the line.

At Gold Run the line attains and thence follows the summit of the divide, which presents a very uniform surface for nearly two miles, and the work will be comparatively light.

Leaving the summit of the ridge near Bradley's reservoir, the line bears to the left, and, following the Bear river slope of the hill, passes one half mile south of, and three hundred feet above, the town of Dutch Flat, to Toll's Mills, a distance of 67 miles from Sacramento, at which point the location survey was suspended. As before stated, the experimental and preliminary location surveys were extended several miles further, and I would suggest the propriety of resuming the surveys at an early day, as the labor required to prepare this division for the contractors will necessarily occupy several months.

As the line beyond this point cannot deviate materially from the line of Mr. Judah's preliminary survey, I would refer you for a general description of the same to his report, made October, 1862, pages 18 to 22.

The location surveys so far made have demonstrated the accuracy of the preliminary survey made by Mr. Judah, and from my own knowledge of the country east of the point to which the location has been completed, I am satisfied that there will not be any material deviation from the line established by him.

The peculiar location of your Road, passing as it necessarily does near the Summit of the Divide, and consequently crossing

the ravines and cañons near their sources, precludes the necessity for large and expensive culverts, or other structures for the passage of water, but few places occurring where more than forty or fifty feet area of water-way will be required.

It will, however, probably be found advisable, as before suggested, to adopt, as a matter of expediency, trestle or other bridging, for many of the deeper ravines or gulches.

Rock for culverts, foundations, etc., can be obtained within a reasonable distance, and frequently in the immediate vicinity of the work, and timber suitable for bridging, etc., is everywhere abundant.

The construction of over one hundred miles of mountain road, and that, too, across one of the most formidable ranges on the continent, where so few important streams are crossed, and so small an amount of expensive bridging actually required, will certainly present an anomaly in the history of railroad enterprises.

GRADES.

The following table shows the distance (in miles) of the different grades used upon the First Division, and eighteen miles of the Second Division:

TABLE OF GRADES.

ON LOCATED LINE OF CENTRAL PACIFIC RAILROAD OF CALIFORNIA, FROM SACRAMENTO.

FIRST DIVISION.		FIRST DIVISION.		SECOND DIVISION.	
GR. PR. MILE.	NO. OF MIL'S.	GR. PR. MILE.	NO. OF MIL'S.	GR. PR. MILE.	NO. OF MILES
Level.....	9.33	42 ft.	.52	Level.....	4.32
3 ft.	3.32	45	.38	5 ft.	.95
5	.38	47	.38	13	.70
11	1.32	53	2.55	19	.21
13	.57	58	1.40	26	.26
14	.57	61	.32	40	.38
16	1.48	63	.57	42	.19
21	4.78	74	.19	61	.07
26	3.28	75	.24	65	.40
28	.51	79	1.34	66	.23
30	.21	82	.38	79	.57
32	.57	90	1.16	95	.38
37	.76	97	.31	100	.38
40	.19	105	12.99	105	9.33
			50.00		18.37

TABLE OF ALIGNMENT,

SHOWING THE AGGREGATE LENGTH OF TANGENTS AND CURVES OF DIFFERENT RADII IN LOCATED LINES OF C. P. R. R. FROM SACRAMENTO TO STATION 3,610.

FIRST DIVISION.		FIRST DIVISION.		SECOND DIVISION.	
RADII IN FEET.	DISTANCE IN MILES.	RADII IN FEET.	DISTANCE IN MILES.	RADII IN FEET.	DISTANCE IN MILES.
15,000	.10	1,042	.09	5.730	.23
5,730	.62	955	4.75	2,865	.32
3,820	.44	882	.54	1,910	.21
2,865	1.39	819	.48	1,433	.85
2,292	.55	800	.17	1,146	1.67
1,910	.55	764	.14	955	1.98
1,637	.46	717	4.25	819	1.74
1,482	.08	714	.03	717	2.19
1,433	2.79	637	.36	637	1.94
1,338	.04	573	.21	573	2.19
1,146	1.28	Tangent.....	30.68	Tangent.....	5.05
			50.00		18.37.

REVENUE.

In estimating the probable business of your Road, when completed across the mountains, the calculations are based upon actual statistics of the freight and passenger business between this city and Nevada Territory, during the last three years. Though during the present season there has been a marked depression of business in that direction, as compared with the two preceding ones, it is not considered that any apprehensions of a permanent decrease of the former business with that region need be entertained. On the contrary, those best acquainted with the resources of Nevada Territory, and the Great Basin towards Salt Lake, are confident in the opinion that another season will witness an animated revival of business in that direction, and that within two, or three years at the farthest, it will largely exceed the business of 1863.

The extent and character of the resources of the Territory occupying the Eastern slope of the Sierra Nevada and the Great Basin, are too well known to require an extended notice here. The evidence afforded by the daily shipments of bullion, is sufficient to convince the most skeptical of the richness and permanent value of the mineral deposits of that region.

Hardly second in importance to the famous Washoe district, are the Esmeralda, Silver Mountain, Humboldt and Reese River

districts, many portions of which are already yielding rich returns for the capital and labor expended in the development of their mines.

As the Eastern slope of the Sierras is but sparsely timbered, and together with the Great Basin is almost wholly unsuitable for agricultural purposes, it is evident that the principal supplies of lumber and fuel, as well as general merchandise and breadstuffs, must be furnished by California. As illustrative of the immense consumption of lumber and fuel in the mining districts, the following extract from the Report of John F. Kidder, Esq., Chief Engineer of the Virginia and Truckee River Railroad Company, made in April, 1863, furnishes some valuable information.

Stating that the average price of fuel in Virginia City, is "$15 per cord," he says, "At Virginia, Gold Hill and Silver City, there are at present two thousand houses, consuming daily forty cords of wood; forty-six steam quartz mills consuming daily two hundred and thirty cords; and nine hoisting engines with a daily consumption of twenty-seven cords, making an aggregate consumption of two hundred and ninety-seven cords.

There are daily used for mining and building purposes, one hundred and twenty-five thousand feet, BM., of lumber and square timber, the cost of transporting which costs twenty dollars per thousand, making an annual consumption of *one hundred and eight thousand cords* of wood, and *forty million feet of lumber*," which is more than three times the amount estimated by Mr. Judah, in his report of 1862, as a legitimate item of Washoe freight. Upon the above estimate of Mr. Kidder, the *Territorial Enterprise* makes the following remarks:

"In the report of Mr. Kidder, the Engineer of the Washoe Valley and Virginia City Railroad, that gentleman makes an estimate, which is altogether too low, of the consumption of firewood in this city, Gold Hill and Silver City, but which foots up one hundred and eight thousand cords. We think the quantity approaches much nearer two hundred thousand cords.

"Now where can this enormous quantity of firewood be obtained in a year or two from this time? At its present value here, which at a very low figure may be set down at $16 to $20 per cord, it makes a sum approaching $350,000 for firewood actually paid out in cash, by but three towns, in a Territory but three years old. There is no denying the proposition that we will have to look beyond the limits of this Territory before many years shall have elapsed for fuel with which to keep in motion the countless number of mills that will eventually be in operation within our border.

"The importance of where our fuel is to come from cannot be overrated."

That this vast trade must be supplied from the inexhaustible forests of California, and pass over your Road, is too evident to require any argument for its demonstration. The road upon which Mr. Kidder reports, is designed to connect with your Road at the most eligible point on the Truckee, and will form a most important auxiliary to the business accruing thereto.

THROUGH FREIGHT FROM CALIFORNIA.

The statement made by Mr. Judah, in his report for 1862, of the amount paid for freight over one route alone, to Nevada Territory, viz: $5,256,000, was received with incredulity by many who were unacquainted with the immense demands of the Washoe trade.

Yet reliable statistics show that the freight paid on shipments from California, across the mountains in the year 1863, amounted to fully two and a half times that sum, or $13,000,000; which is twice the amount paid for freight received at San Francisco from domestic and foreign ports during the same year.

Estimating the average price of freight from California to Nevada, during the year (1863), at five cents per pound, we have 130,000 tons of freight transported by teams across the mountains, in one year, exclusive of westward bound freight, such as minerals, lumber, etc.

Full statistics of the business of 1864, to date, have not been obtained, but from the data at hand, it is fair to assume that freights for the years 1862–3 and 4, will average 72,500 tons.

It is also safe to assume that within three years this average will be more than doubled, which amount, it will be seen, will but slightly exceed the business of 1863, and that your road will, when completed, command fully four-fifths of the Nevada freight and travel, as competition by teams and stages will be entirely out of the question.

This gives as a perfectly safe basis for an estimate, 116,000 tons of freight per annum.

PASSENGERS.

The following extracts from published statistics are given to show the data upon which the estimates of revenue from this source are based:

"During the months of August, September, and October, 1862, the average number of passengers over one route across the mountains was—

Stage passengers	37
In carriages and on foot	68
Total per diem	105

"In the months of February, March, and April, 1863, the number of persons who crossed the mountains on one route, is estimated as follows:

Footmen	6,607
Horsemen	833
Stage passengers	3,154
Total	10,594

Or an average amount of 119 per diem.

"For the six months ending January 1, 1864, the stages on one route alone carried 10,500 through passengers," or an average of 58 per day.

Allowing one-half this number for other routes, and we have 87 through passengers per day. Add for those traveling by private conveyances, 87, and we have a total of 174 passengers per day This is believed to be a low estimate, and not exceeding the average for the last three years.

It is a well established fact that travel is everywhere proportionate to the facilities afforded for its accommodation, and were a railroad completed across the mountains to-day, the travel between California and Nevada Territory would (with the present amount of business) be increased at least fifty per cent. It is, then, safe to assume that with the prospective increase of business, there will, at the end of three years, be fully double the present amount of travel, or 350 passengers per day.

Allowing one-fourth of this number to go by other routes, there still remains an average of 263 passengers per day, or a total of 95,995 per annum.

ESTIMATED ANNUAL RECEIPTS IN GOLD COIN FROM PASSENGERS IN CALIFORNIA.

Junction and other way passengers per day, both ways	40
Auburn passengers—including those from the lower portion of Nevada county, per day, both ways	25
Illinoistown passengers, including those from Nevada Grass Valley and Sierra county, per day	40
Dutch Flat, including upper portion of Placer and Nevada counties, per day	30

SUMMARY.

14,600	Junction and way passengers	average $1 50...	$21,900 00
9,125	Auburn	" 3 50...	31,937 50
14,600	Illinoistown	" 5 50...	80,300 00
10,950	Dutch Flat	" 6 75...	73,912 50
	Total, in gold coin		$208,050 00

ESTIMATED ANNUAL RECEIPTS FOR FREIGHT IN CALIFORNIA—IN GOLD COIN.

10,000	Tons	Auburn and way average	$4 00...	$40,000 00
27,000	"	Ill'town { including Nevada, Grass Valley, Sierra Co., Iowa Hill, Forest Hill, etc., etc., }	$8.....	216,000 00
10,000	"	Dutch Flat and vicinity	10 00..	100,000 00
20,000	"	Return freight, including stone	1 50...	30,000 00
20,000		Cords wood	2 50...	50,000 00
10,000,000		Feet B.M. lumber	6 00...	60,000 00
		Total receipts for freight		$496,000 00
		Add passengers		208,050 00
		Total annual receipts from Cal. business		$704,050 00

ESTIMATED ANNUAL RECEIPTS FROM THROUGH BUSINESS TO AND FROM NEVADA TERRITORY.

116,000	Tons merchandise	$22 50...	$2,610,000 00
100,000	Cords of wood	5 00...	500,000 00
30,000,000	Feet B. M. lumber	10 00...	300,000 00
16,000	Tons return freight	10 00...	160,000 00
96,000	Passengers both ways	12 00...	1,152,000 00
	Express and mails		30,000 00
	Total		$4,752,000 00
	Add for business in California		704,050 00
	Total annual receipts in gold coin		$5,456,050 00
	Deduct for expenses for operating, etc.		1,636,800 00
	Leaves net revenue of		$3,819,250 00
	Or 25 per cent per annum on a capital of		$15,200,000 00

ESTIMATED RECEIPTS TO DUTCH FLAT.

Your road will, when completed to Dutch Flat, command all the local business of Placer, Nevada, Sierra, and a portion of El Dorado counties, as well as the greater portion of the Nevada freight and passenger business, which is estimated as follows:

Annual receipts from passenger business in California (see foregoing estimate)	$208,050 00
Annual receipts from freight in California (see foregoing estimate)	496,000 00
77,500 tons Nevada freight, $10	775,000 00
48,000 Nevada passengers (both ways), $6 75	324,000 00
Express and mails	20,000 00
Total annual receipts in gold coin	$1,823,050 00
Deduct expenses of operating, etc	546,000 00
Leaves net revenue per annum	$1,277,050 00
Or 25 per cent. upon a capital of	$5,100,000 00

LOCAL RESOURCES OF PLACER AND ADJOINING COUNTIES.

The development of the mineral resources of Placer and the adjoining counties, which embrace the richest mining district of the State, will add largely to the local business of your Road.

Besides the placer diggings of the foothills, and the heavier gravel deposits through the central and upper portions of the counties referred to, which have heretofore occupied almost exclusively the attention of the gold miner, the large and valuable veins of quartz which traverse the whole western slope of the mountains, are being prospected and worked with success. Recent discoveries of quartz of unusual richness have been made in the vicinity of Illinoistown, and also on Diamond Creek, Nevada county, within five miles of Bear Valley. Mills have been erected and extensive preparations made for the reduction of the rock. The development of the vein at the latter places indicates that it will prove one of the richest yet discovered in that county. At numerous other points in the vicinity of the line, important and promising veins of quartz have been discovered, and with the fine water privileges in the vicinity of these ledges, it only needs capital and enterprise to develop a source of immense wealth to the country. The opening of your road is already calling public attention to these facts.

At Gold Run, and Dutch Flat, the railroad line crosses the rich vein of auriferous gravel which stretches from Quincy and Pilot Peak on the north, through Downieville, Forest City, Moore's Flat, Alpha, Dutch Flat, Iowa Hill, Forest Hill, Georgetown, and so on to the southern mines, and in which the richest deposits of gold are found. At those places, and at Red Dog, Waloupa, Little York, You Bet, Yankee Jim's, Michigan Bluffs, and other important mining towns in the vicinity of the railroad, the

mines are worked by the hydraulic process, and are yielding rich returns.

Copper ore is also found in the immediate vicinity of Auburn, and between that place and Grass Valley. Some of these mines afford evidence of great richness, and will undoubtedly, in time, be a source of revenue to the Road.

Soapstone of an excellent quality, and in inexhaustible quantities, is also found near Rattlesnake Bar, but a few miles from Newcastle. This rock is an excellent substitute for fire-brick.

Limestone of a superior quality is also found at numerous points in the vicinity of the Road. A large portion of the lime brought to this market is from the kilns at Alabaster Cave, Lime Point (two miles from Auburn) and the American river quarries, about one mile from Neilsburg.

IRON.

Extensive beds of iron ore are found in the vicinity of Neilsburg, and about one mile from the line of your Road. This ore is of a superior quality, and will yield from seventy to ninety per cent. of metal.

The high price of labor in this State, has hitherto precluded the working of these ores with economy, and as yet no efforts have been made to develop these mines, or even to bring them into public notice.

With the facilities afforded for the reduction of this ore, viz.: the cheap production of charcoal in the forests of the Sierras, and of stone coal from the Truckee river mines, and cheap and abundant water power, it is believed that within a few years, capitalists will find this a profitable field for investment, and that the transportation of this ore and its products will form an important item in the business of your Road.

COAL.

The recent discovery and working of the coal mines at Crystal Peak, near the Truckee river, and in the immediate vicinity of your Road, is an important fact for consideration in connection with your future business. From accounts received, it is believed that coal of a superior quality, and in inexhaustible quantity, has been discovered at the eastern base of the mountains at the point named.

The lack of fuel between the Sierras and Salt Lake, has always been considered one of the greatest difficulties attending the working of that division of the Pacific Railroad. These discoveries will remove that obstacle, and will also furnish a large amount of return freight to California.

GRANITE.

I wish to invite your particular attention to the extensive granite quarries in the immediate vicinity of your road. These quarries are found at numerous points between Rocklin and Auburn, a distance of thirteen miles, and for quality of rock are unsurpassed by any in the State.

All varieties of color are found, from the darkest to the lightest, and of every degree of hardness desirable for different classes of work.

The most important quarries yet opened are at Rocklin, within twenty-two miles of Sacramento, which is a less distance than similar quarries can be reached by any other road. The unusual cheapness with which this rock can be quarried—the ledges being everywhere accessible by spur tracks—thus avoiding the cost of intermediate transportation—will, with the low rates of freight at which it can be delivered here, place it in market at a figure that will defy competition.

The quality of the stone alone, would give it pre-eminence in the market at even the present ruling rates. It is of a close, even texture, of a light bluish color, and entirely free from the hard knots and discolorations, which render so much of the granite heretofore brought to this market, unfit for the best class of work. .

It has received the unqualified approbation of the State Capitol Commissioners, and they have already contracted for the delivery of all the granite required for the completion of the capitol building, from these quarries. The following is an extract from the report of Reuben Clark, Esq., the able and experienced architect of the building, to the Board of Capitol Commissioners:

"On the Pacific Railroad line there has been discovered a most excellent quality of granite. I visited the quarries, and found it in quantity inexhaustable, and in quality free from all black knots and stains, and of excellent rift."

These and other quarries upon the line of the road are now being opened on an extensive scale, and preparations are made for bringing large quantities of the stone into market at an early day, and it is believed that within a few months you will be able to secure, and thenceforth command the entire granite trade of the State.

WATER POWER.

The value of the unlimited motive power afforded by the waters of the Truckee, Yuba and Bear rivers, and the facility and cheapness with which it can be applied to manufacturing purposes, are facts worthy the attention of capitalists. The rapid

declination of these streams renders them available at almost any point; and the dense forests of pine, fir and tamarack growing upon their slopes, suggest a ready means of securing the advantages which they offer. Abundant power can also be obtained by using the water of the mining ditches, which, until transit by rail is supplied, are in some localities more convenient of access than the natural streams.

This water can be used without wastage, and consequently at but trifling cost, as it will in no case be necessary to divert it from its present channel, except for the short distance required to gain the desired elevation.

Thus the Bear River ditch, which in the Winter season carries 3,500 inches of water, (miner's measure) and at its lowest Summer stage never has less than 500 inches, can at numerous points be used for the purposes mentioned.

Near Clipper Gap the water of this ditch runs for about three-fourths of a mile in the natural bed of a ravine, falling in that distance nearly three hundred feet. At the head of Auburn Ravine, and within three miles of the town of Auburn, it has in about a mile, a fall of 200 feet, and again about one mile above Newcastle, it crosses the line of the road and runs into Dutch Ravine, falling 200 feet in one-fourth of a mile.

There are other points also convenient to the line of your Road, where the same water can be used, with a fall of from 20 to 40 feet.

Other ditches in the vicinity of Gold Run and Dutch Flat, with a larger supply of water, also present similar advantages.

The abundant power thus afforded may be considered permanent, as the mining and agricultural interests will always demand a supply of water fully equal to the present capacity of these ditches.

WOOD, LUMBER, ETC.

The importance of the wood and lumber trade that must eventually accrue to your Company, can hardly be over-estimated.

The completion of the first fifty miles of your Road, will render available a large amount of the timber lands adjacent to the line, which are now comparatively valueless; and besides the importance of the carrying trade already alluded to, an important item in the construction of the road will be saved by procuring the timber and ties needed, in the immediate vicinity of the line.

For general use, the red fir is probably the best timber that can be obtained until the Road reaches the Yuba, where tamarack is found in abundance. The latter is, in my opinion, the

best timber produced in this State for ties and other railroad purposes. It will resist decay as well as redwood, and in point of strength and elasticity, is probably equal to the Puget Sound pine. The completion of the Road to Newcastle has placed within reach of the Sacramento market, large quantities of the live oak, white oak, etc., growing upon the foot hills, which, for lack of facilities for transportation, has hitherto borne but a nominal value.

LANDS.

The lands granted to your Company by the National Government, viz. twenty sections, or 12,800 acres for each mile of road, is an important source of revenue for its construction. You are now entitled to these lands for thirty-one miles, or a total of 396,800 acres, which, at the minimum Government price, may be estimated as worth $496,000.

Many of these lands bordering on the Sacramento, American and Bear rivers are among the most fertile in the State. The value of the timber products of the foothill lands, has already been alluded to. Many of the latter are also susceptible of a high state of cultivation. From their peculiarity of soil, they are particularly adapted to the cultivation of fruit, and in ordinary seasons, the cereals are grown with success. With a proper system of irrigation, these lands may be made highly productive. For the production of the vine, they are considered as far superior to the low lands of the valley, and this fact is already attested by the successful cultivation of numerous and extensive vineyards. That the wine-producing districts of this coast will in future be confined almost exclusively to the foothills, there can be no doubt.

FACILITIES FOR TRAVEL.

The present facilities afforded by your Road, and the connecting Stage Lines for the accommodation of travel across the mountains, are unequaled upon any other route.

Persons traveling via the Central Pacific Railroad, and the Dutch Flat and Donner Lake Wagon Road, reach Virginia City in from four to six hours less time than by any other line. Since the California Stage Company placed their coaches upon this line in July last, the average time for the trips from Sacramento to Virginia has been but seventeen hours.

This road, which was commenced in 1863, and completed in June last, is by far the best road yet constructed across the mountains. It accomplishes the ascent of the Western slope of the Sierras with a much lighter maximum grade than has here-

tofore been deemed possible to attain within the limits of expense which such an enterprise would justify.

The maximum ascending grade, (eastward) is but ten inches to the rod, or less than one-half the maximum grade on the other most important roads crossing the mountains.

It is constructed in the best possible manner, and is everywhere wide enough for teams to pass each other without difficulty.

Commodious hotels have been erected along the route, and preparations are being made to keep the road open during the Winter.

No difficulty is apprehended in doing this, as the snow-fall is believed to be much lighter upon this, than upon the other routes, via the Henness and Johnson Passes.

This comparative immunity from heavy snows, which frequently form a serious obstruction to travel across the mountains during the Winter months, is chiefly due to the *difference in altitude* between this and the other routes named, there being several hundred feet in favor of this route.

The question of the obstruction of a railroad by snow, and the practicability of keeping the line open for business during the Winter months, is a very interesting and important one, and cannot be better answered than has already been done by Mr. Judah in his report for 1862, from which the following extract is taken:

"The argument of obstruction from snow being frequently urged against the Central route for the Pacific Railroad, I have taken much pains to arrive at correct conclusions upon this subject, and feel warranted in the statement *that a railroad line upon this route can be kept open during the entire year* for the transaction of its business.

It is true that snow falls to a greater depth upon the elevated portions of this line than upon the lines of railroads in the Atlantic States.

The depth at which snow lies upon this route is plainly distinguishable at any season.

The trees are generally covered with moss down to the level of the snow, and thousands of them can be seen entirely free from moss up to a certain hight, and almost entirely covered with moss from that hight.

Frequent marks have also been made by persons who have traversed the route on snow-shoes during the Winter, by axe-marks chopped in the trees at the level of the snow.

The limbs of the small trees also afford indications of the hight of snow; those limbs lying beneath the snow maintaining their natural or original position, while those above the snow-line are almost universally bent downward, and not unfrequently broken by the weight of snow.

These observations lead to the conclusion that the greatest depth of undisturbed snow is thirteen feet at the summit.

In places where drifts occur, the depth is of course greater and at corresponding points, less than the average level.

This may, at first, seem to be a serious obstacle to the passage of railroad trains. But this depth of thirteen feet is not the result of a single storm, but the *accumulation of a number of successive storms, occurring during the Winter.*

Snow does not melt very rapidly at this elevation during the Winter.

A storm will occur, and snow fall to the depth, perhaps, of three or four feet.

Another storm will, perhaps, add two or three, or four feet to this depth.

Successive storms add to its depth; but it is believed that its highest level is not over thirteen feet.

The town of Dutch Flat, 67 miles from Sacramento, and 35 miles from the summit, may be considered the foot of snow-line on western side—snow seldom falling more than two feet there, and melting off in a day or two.

The average depth of snow at lower end of Donner Lake is about six feet.

At Neil's Ranch, on the Truckee River, 28 miles easterly from the summit, I am assured by Mr. Neil, that the greatest depth of snow last Winter was eighteen inches, and that during the five years he has lived there, it has not exceeded three feet in depth.

It may be safely concluded that the line of deep snows terminates where our line strikes the Truckee River, or say 12 miles from the summit, making 47 miles of snow line.

It will also be remembered that our line is almost exclusively a *side-hill line*, from which the snow can be more easily removed than from a level surface.

It is only necessary, then, to start an engine with snow-plows, from the summit each way, at the commencement of a storm, clearing the snow as it falls. A similar course of procedure at each successive storm, will keep the track open during the entire Winter.

It is also stated that a crust soon forms upon the snow, which prevents its drifting badly.

The only point where we shall encounter a level surface of snow is in Summit Valley, for about two miles.

By elevating the track at this point, no trouble need be anticipated.

The great dread, and real danger of a storm in the mountains does not arise from the depth of snow, but from the entire absence of shelter and relief in the mountains, there being no houses or accommodations, excepting upon the wagon roads across to Washoe."

The "deep snow-line" does not extend more than twenty miles westerly from the summit, so that the distance will not exceed thirty-two miles where any greater difficulties need be apprehended than are ordinarily encountered upon Eastern roads during the winter months. In further illustration of this subject, reference is made to the above mentioned report, pages 25 to 27.

SURVEYS IN NEVADA TERRITORY.

An experimental survey was made in November and December last, from the terminus of Mr. Judah's line, near the eastern boundary of California, to a point five miles east of the Big Bend of the Truckee, a distance of fifty-three miles. The result of this survey was highly satisfactory, developing a line with easy grades and curves, and for the greater portion of the distance, with very light work. At three points on the experimental line, grades of seventy-nine feet per mile were introduced, for short distances, but a careful location will reduce the maximum to fifty feet per mile. The maximum curves will probably not exceed six degrees, or a radius of 955 feet. The only heavy work occurring on the line, will be through the Cañon below the Big Meadows, and for a distance of about five miles, and even there a large portion of the heavy cutting shown upon the profile, may be avoided by crossing the river two or three times at its narrowest points. From the lower end of this cañon to the Big Bend, the slightly undulating surface of the country, will admit of a rapid and easy construction of the road.

At the Big Bend the line leaves the river, and bears eastward across what is known as the Truckee Desert, towards the Sink of the Humboldt. Beyond the terminal point of the line, no explorations were made, as from the well known character of the country to the eastward, no doubts exist as to the practicability of the route to the Sink of the Humboldt, and from that point to Salt Lake, the choice of routes must be hereafter determined by proper explorations and surveys.

The present Engineer force in the field consists of one party on construction of First Division, in charge of Mr. Chas. Cadwalader, and one party employed on location of Second Division, in charge of Mr. L. M. Clement.

Respectfully submitted,

SAM. S. MONTAGUE,

Acting Chief Engineer C. P. R. R. of Cal.

SECRETARY'S REPORT.

OFFICE OF THE CENTRAL PACIFIC R. R. Co.,
December 1st, 1864.

The total amount of the capital stock of the Company issued and subscribed, is 14,987 shares.....$1,498,700 00

The total indebtedness of the Company is as follows, viz:

First mortgage bonds issued	1,394,000 00
Individual accounts	159,226 14
Unadjusted accounts, and November pay-rolls	20,000 00
Bills payable	20,859 79
	$1,594,085 93

The assets of the Company are:

Amount due from stockholders	$138,596 68
Placer county bonds	75,000 00
Sacramento County bonds	163,500 00
Amount due from the City and County of San Francisco in 7 per cent. bonds, principal and interest payable in gold	400,000 00
Amount due from the Government of the United States, in 30 year 6 per cent. bonds, (on the 30 miles of road completed and accepted by the Government.)	1,264,000 00

Every alternate section of public land, (except mineral land,) for twenty miles on each side of the road, granted to the Company by the United States.

Under authority of an Act of the Legislature of the State of California, the Company has executed and holds one million and a half of bonds, on which the State pays interest at 7 per cent. in gold coin, for twenty years, from the 1st of July, 1864.

Thirty-one miles of railroad and telegraph line completed, with all necessary depot buildings, etc.

Grading beyond Newcastle has been done to an amount exceeding one hundred thousand dollars.

Eight locomotives, ten passenger cars, four mail and express cars, one hundred and twenty-four freight cars, five hand cars and three construction cars, extra axles, wheels, tires, etc.

Six thousand tons of iron, about three thousand tons of which are laid, the greater part of the balance has arrived; there is

also purchased, but not yet shipped, two thousand tons additional.

Chairs and spikes sufficient to lay all the iron, and ties enough for twenty-two miles of road beyond Newcastle, are on hand.

BUSINESS OF THE ROAD.

On the 26th of April, 1864, the track was completed from Sacramento to Junction, a distance of 18½ miles, and trains were run daily over the road to that point. Little freight, however, passed over the road until the 10th of the following June, when it was opened to Newcastle, 31 miles from Sacramento, and regular freight and passenger trains commenced running to that point.

The following is a statement of the number of passengers transported each month, and the amount received therefor:

	PASSENGERS.	AM'T REC'D.
April 26 to 30	298	$ 354 25
May	8,906	4,291 25
June	7,329	9,364 30
July	7,687	11,047 35
August	6,508	10,107 14
September	4,726	8,801 22
October	7,615	10,089 90
November	6,870	9,347 74
Total	48,941	$63,403 15

The following statement shows the amount received for transportation of freight each month:

April 26th to 30th	$ 183 25
May	160 50
June	3,993 86
July	5,002 70
August	6,393 72
September	7,668 04
October	8,110 82
November	7,154 00
Total	$38,666 89

There has been received for transportation of Express matter and Messengers $ 1,487 50

The expenses of operating the Road from April 25th to December 1st have been as follows, viz.:

For repairs of Locomotives	$ 3,089 95
For repairs of Cars	3,234 47
For repairs of Track	9,520 41
For repairs of Buildings	251 95

For repairs of Bridges	1,343 64
For Locomotive service	3,666 73
For Train service	3,634 49
For Station service	6,953 54
For Fuel and Water	5,746 12
For Oil, Waste, etc	842 38
For Stationery and Printing	565 00
For Advertising	836 75
For Office expenses	75 95
For Damage to freight	141 67
For Miscellaneous damage	137 00
For Taxes	10,051 61
For United States Revenue Tax	1,060 14
For Incidentals (fixtures for trains, depots, etc.)	449 18
For Telegraph Expenses	8 00
Total	$51,608 98
November Pay Rolls not yet distributed	4,680 19
Total operating expenses	$56,289 17

RECAPITULATION.

Passengers	$ 63,403 15
Freight	38,666 89
Express	1,487 50
Gross receipts	$103,557 54
Operating expenses	$56,289 17
Net earnings in gold coin	$47,268 37

Miles run by passenger trains, 14,016; miles run by freight trains, 19,468.

Average rate of speed of passenger trains, including stoppages, has been 22 miles an hour. Average rate of speed of freight trains, including stoppages, has been 15½ miles an hour.

There has been but one accident to persons on the road during seven months running. Frank Brady, an employee of the Company, in attempting to get on a construction train in motion, was injured so as to cause his death in a few days.

The earnings will be increased fully 50 per cent. by the further extension of the road, soon to be completed to Rock Creek or Neilsburg station, 42 miles from Sacramento, while the expenses for operating the road to that point will not be materially increased.

E. H. MILLER, Jr., Secretary.

No. 7.

Central Pacific Railroad.

STATEMENT

Leland Stanford Pres
of C P R R — MADE TO THE —
Andrew Johnson

PRESIDENT OF THE UNITED STATES,

AND

SECRETARY OF THE INTERIOR,

October 10th 1865

OF THE

PROGRESS OF THE WORK,

OCTOBER 10th, 1865.

SACRAMENTO:
H. S. CROCKER & CO., PRINTERS, 92 J STREET.
1865.

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Stanford, Leland

Central Pacific Railroad.

STATEMENT

MADE TO THE

PRESIDENT OF THE UNITED STATES,

AND

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OCTOBER 10th, 1865.

SACRAMENTO:
H. S. CROCKER & CO., PRINTERS, 92 J STREET.
1865.

Office of the Central Pacific R. R. Co.,
Sacramento, Cal., Oct. 10, 1865.

To His Excellency, ANDREW JOHNSON, President of the U. S.,
and the Hon. JAMES HARLAN, Secretary of the Interior:

Sirs—By the laws of Congress, known as the Pacific Railroad Acts, this Company was selected as one of the agents of the National Government, to construct the Western portion of that important national highway, the Pacific Railroad. The great interest taken by the Government and the people in its speedy completion, and the approaching session of Congress, would seem to justify a report from us of the progress made, and the prospect of the final completion of that portion of the work entrusted to this Company.

The first Pacific Railroad Act was passed July 1, 1862. It provided for the construction of a railroad and telegraph line from the Missouri River to the Pacific Ocean, a distance of about two thousand miles, and crossing the Rocky and Sierra Nevada Mountains. By its terms, this Company was authorized to build that portion lying between the Pacific Coast and the Eastern boundary of California, and from thence eastwardly until a meeting and connection should be formed with the road in the course of construction from the East.

SURVEYS MADE IN 1861.

In the Summer of 1861, and prior to the passage of that law, this Company made several surveys and examinations of routes

for a railroad over the Sierra Nevada Mountains, under the superintendence of its Chief Engineer, the late T. D. Judah, Esq. These were the first complete and thorough instrumental surveys ever made over those mountains They were made for the purpose of ascertaining whether a feasible route existed, a fact long considered doubtful, and which had formed the great obstacle to the passage of a Pacific Railroad Bill. The result of those surveys and examinations fully demonstrated, not only the entire practicability of the line by the South Yuba and Donner Pass, but its great superiority over all other known routes. It was, therefore, adopted by the Company, after a full and careful consideration of so important a matter.

NECESSITY OF DISPATCH.

By the 9th Section of the Act, this Company was required to file its acceptance of its provisions, and assume the obligations and responsibilities therein imposed, within six months after its passage, which was done on the 3d day of December, 1862. By the 10th Section, we were required to complete fifty miles of the line within two years after filing the acceptance. The first fifty miles from Sacramento, the point from which this Company commences its portion of the work, carries the road far up the Western slope of the Sierra Nevadas, attaining an elevation of 2,306 feet, and includes some of the heaviest and most expensive grading on the whole line. All the iron, rolling stock and railroad material had to be manufactured in the Atlantic States, requiring months of time, and then transported by sea and river thousands of miles, running the gauntlet of the rebel pirates, involving an expense of ten per cent. war risk insurance on all the material, and taking an average of ten months time from its receipt on shipboard to its delivery at Sacramento. Time was also required to make the necessary location surveys, preparatory to the commencement of the work of grading. No time was therefore to be lost. Although the original Act contained

many provisions which rendered it difficult to induce capitalists to take an interest in so hazardous and expensive an undertaking, the ultimate success of which was still deemed uncertain, yet we did not hesitate to enter upon it vigorously, trusting that Congress would remedy the defects of the law. Many of these defects have been removed by subsequent legislation.

PROSECUTION OF THE WORK.

During the Summer and Fall of 1862, several parties of engineers were kept in the field, to secure the most favorable location of the first fifty miles of the road, and prepare the line for grading. An agent was promptly sent to the Atlantic States to procure the necessary iron, rolling stock and other railroad material; contracts for which were entered into immediately upon his arrival there. Contracts were also let for grading thirty-one miles, from Sacramento to Newcastle.

The work of grading was commenced in February, 1863. The first shipment of iron reached Sacramento October 8, 1863, and the track laying was immediately commenced, and steadily continued, with a few delays caused by the non-receipt of iron and ties within the contracted time, up to June 6, 1864, when the road was completed to Newcastle, a distance of 31 miles, attaining an elevation of about 1,000 feet above tide water. Much of this portion of the line is in rolling, rocky hills, requiring deep cuttings and heavy embankments, and was very expensive. The road was put in operation as soon as completed, and the trains have been run over it daily ever since—without any stoppage.

The work of grading has been continued without cessation from the commencement, in February, 1863, up to the present time. The road was completed and put in operation from Newcastle to Clipper Gap, a distance of 12 miles, attaining an elevation of 1,785 feet, June 10, 1865, and to Colfax, a further distance

of 12 miles, September 1st, making in all 55 miles from Sacramento, and attaining an elevation of 2,448 feet. Not less than three daily trains each way, have been run constantly, over the whole completed line, except on Sundays.

The grading between Newcastle and Colfax was very difficult and expensive, increasing as the line was pushed up the mountain slope. The cuttings have been deeper, the embankments higher, and more rock work encountered, as the line has progressed eastward. One cut is 63 feet deep and 800 feet long, and several others are from 40 to 50 feet deep and from 800 to 1,200 feet in length, all of which were through rock or hard cement, requiring to be blasted. Several expensive trestle bridges have been constructed across deep ravines, some as high as 100 feet in the center. Some of the embankments are over 70 feet high. Time is required to complete such heavy work. The first fifty miles was completed prior to the 1st day of September, 1865, and several months within the time required by the Acts of Congress, as extended by the 5th Section of the amended Act, passed July 2, 1864—an extension which was found necessary on account of the difficult character of the work.

DIFFICULTIES TO BE OVERCOME.

Nearly all this time the war with the rebels was raging. The only currency used in California as a circulating medium has been gold and silver coin—the national treasury notes having been practically excluded from general circulation. The Company has, therefore, been compelled to use coin in all its business transactions in this State—including all its large expenditures for ties, grading, bridge building, track laying, etc. The lack of capital, and the high rate of interest, which has generally been two per cent. per month, in California, compelled us to resort to the Eastern States for the means to prosecute the enterprise. In those States the national currency is in universal use, but to convert that currency into coin, when the latter ranged at a

premium of 200 to 280, involved too great a sacrifice. Thus the Company found itself hampered in its financial operations, and unable to secure the amount of coin necessary to carry on the work as vigorously as they desired, without a serious sacrifice of its means. Other causes of delay occurred, but as they were merely of a local and temporary character, it is unnecessary to refer to them.

On the first day of January, 1865, the prospect of a speedy close of the war, and favorable decisions by our State Courts of several matters which had been in litigation, placed the affairs of the Company in such a position, that we felt justified in putting forth all our energies. A call was issued for 5,000 laborers, and from that day to the present, every able bodied laborer that could be procured, has been employed and kept constantly at work in the construction of the road. Labor is, however, scarce and dear in this State. For several months the number procured was comparatively small, but recently they have increased more rapidly, until now 5,000 men are employed, with over 600 teams, and the prospect is, that the number of laborers will be increased to 6,000 during this season.

CHINESE LABOR.

A large majority of the white laboring class on the Pacific Coast, find more profitable and congenial employment in mining and agricultural pursuits, than in railroad work. The greater portion of the laborers employed by us are Chinese, who constitute a large element in the population of California. Without them it would be impossible to complete the western portion of this great national enterprise, within the time required by the Acts of Congress.

As a class they are quiet, peaceable, patient, industrious and economical—ready and apt to learn all the different kinds of work required in railroad building, they soon become as efficient as white laborers. More prudent and economical, they are con-

tented with less wages. We find them organized into societies for mutual aid and assistance. These societies, that count their numbers by thousands, are conducted by shrewd, intelligent business men, who promptly advise their subordinates where employment can be found on the most favorable terms.

No system similar to slavery, serfdom or peonage prevails among these laborers. Their wages, which are always paid in coin, at the end of each month, are divided among them by their agents, who attend to their business, in proportion to the labor done by each person. These agents are generally American or Chinese merchants, who furnish them their supplies of food, the value of which they deduct from their monthly pay. We have assurances from leading Chinese merchants, that under the just and liberal policy pursued by the Company, it will be able to procure during the next year, not less than 15,000 laborers. With this large force, the Company will be able to push on the work so as not only to complete it far within the time required by the Acts of Congress, but so as to meet the public impatience.

FUTURE PROSPECTS.

With the force of laborers which we are confident can be procured, if the National Government shall promptly issue to us the bonds granted by the Acts of Congress, we shall be able to complete the railroad over the Sierra Nevadas to the Truckee river, a distance of 120 miles from Sacramento, attaining at the Summit an altitude of 7,000 feet above tide water, during the year 1866. Thence to a point 50 miles east of the Great Bend of the Truckee river, during the year 1867, and to Salt Lake in two years thereafter, where we hope to meet the road being built from the East. We feel confident of being able, after reaching the Truckee river, to construct the road eastward as rapidly as the track can be laid.

The construction of a railroad over so high a mountain range, is necessarily slow and expensive, but it is the deter-

mination of this Company to press on vigorously, and to employ all the men and means they can command, to complete the road as early as practicable. We have encountered and are now laboring upon the most difficult and expensive portion of the line entrusted to us. This, too, at the very commencement of our efforts. But another year will enable us to extend the road over the long dreaded Sierras. We have gone far enough already to convince the most incredulous, not only of the entire feasibility of the route, but that the work can and will be accomplished within the time stated.

CHARACTER OF ROAD BUILT.

The road, so far as completed, will compare favorably with any other railroad in the United States. The rails used are of the best quality of American iron, from 24 to 28 feet long, and weighing 60 pounds to the yard. The chairs are of wrought iron. The cross ties are 6 by 8 and 10 inches, and 8 feet long, of redwood, which is equal to red cedar or locust for durability, and number 2,400 to the mile. The culverts are all of granite or other hard rock, except a few of hard burnt brick in the valley, where stone could not be procured. The bridges and trestle work are made of the best quality of Puget Sound timber, with redwood sills, placed on foundations of masonry. The drainage is ample and complete. The road is well ballasted with gravel and broken rock. The alignment is remarkable for its directness in such a broken, mountainous country. The least radius of curvature is 573 feet, or ten degrees. The grades are necessarily high to surmount the summit, which is 7,000 feet above the sea level, which is attained without any undulatory grades—the rise and fall being constant—and no elevation being lost. The highest grade used is 105 feet per mile, of which there are 13½ miles on the present completed line. We find no difficulty in operating these portions of the road, running the regular passenger trains thereon at the rate of 25

miles, and freight trains 12 miles per hour. A greater speed could be obtained, but so far it has not been found necessary.

Mr. Geo. E. Gray, late Chief Engineer of the New York Central Railroad, after a careful examination of the work, reports as follows: "That portion of the railroad completed and in operation from the city of Sacramento to Clipper Gap, 43 miles,* will compare most favorably in every respect with any railroad in the United States." The locomotives and cars in use are of the best kind, of American manufacture, and kept in perfect order. All the tunnels will be constructed wide enough for double tracks, as we are confident a double track will be needed in a few years to do the business of the road.

STATISTICS OF WORK AND MATERIAL.

The following is a statement of the amount of work done, and materials and rolling stock purchased up to this date:

Earth excavated—No. of cubic yards	1,465,970
Rock excavated—No. of cubic yards	821,984
Stone masonry—No. of cubic yards	21,299
Culverts, No. 215—length in feet	12,626
No. of brick in the work	389,894
Timber and lumber in structures, feet B. M.	2,034,106
No. of ties laid	135,000
No. of ties contracted for	125,000
Tons of iron laid	6,000
Tons of iron purchased and not laid	2,000
Pounds of iron in bridges	162,700
No. of locomotives in use	6
No. of locomotives purchased and shipped	5
No. of locomotives being constructed	4
No. of cars in use	134
No. of cars shipped	124

A steam engine and the proper machinery for large machine, repair and car shops, has been shipped from the Eastern States

* That portion between Clipper Gap and Colfax has been completed since his report.

and is now over due. A large wharf with steam engine and derricks, with suitable freight and passenger depots, have been constructed at Sacramento. Depot buildings have also been constructed at all the towns on the road. The flooring and platforms of the freight depot at Colfax are 600 feet in length and 56 feet wide. The road is well supplied with water tanks (built of redwood), switches, side tracks and turn-tables.

There is, in addition to the completed road, a large amount of grading and other work done upon that portion of the line between Colfax and Dutch Flat and points above, a distance of 25 miles, which is now being rapidly prepared for the track. A full force is also employed constructing a tunnel 1,600 feet in length at the summit of the Sierras, as also another tunnel 900 feet long, 7 miles east of the summit, with three shifts of laborers working eight hours each, night and day. Work has also been commenced on all the tunnels between Dutch Flat and the Truckee River, 8 in number. The whole cost of the work done and materials purchased amounts to the sum of $5,596,476 89.

GOVERNMENT COMPENSATION.

The road had been completed 43 miles to Clipper Gap, before any of the compensation granted by the Acts of Congress was received by the Company. If the bonds authorized by Congress shall be promptly issued upon the reports of the Commissioners, the work will be greatly expedited, as the Company can make the necessary financial arrangements for employing a large force, without fear of embarrassments caused by delays in the receipt of this portion of its means.

With the large force of laborers employed, and which will be greatly increased next year, with large contracts for the supply of iron, rolling stock, timber and other railroad material, and engaged as we are in the construction of the most difficult and expensive portion of the whole line between the Missouri

River and the Pacific Ocean, the Company will need all the means it can command, to push on the work as vigorously as the public necessities demand.

The rails used being of extra weight, and the high grades requiring powerful locomotives, all these have to be manufactured specially for the Company, and have to be paid for upon delivery on board ship, full ten months before they can be placed upon the road. In addition, large disbursements are required to grade the road in advance of the completed line. Thus it follows that the Company are compelled to expend generally over $4,000,000 in advance, before receiving the Government bonds, upon the different sections of completed road. It will be seen that any great delay in receiving the means provided by Congress, will necessarily cause a serious derangement of our plans, and hinder the progress of the work.

In conclusion we would say, that it is the intention of this Company to carry out the requirements of the Acts of Congress with scrupulous fidelity, to construct a permanent first class railroad and telegraph line, one that will do credit to the nation, for whose benefit, and under whose auspices it is made, and that will perform all the services required of it in every emergency.

Having a thoroughly organized force of trained laborers, under the management of most efficient Superintendents and Foremen, a force which can be increased to any extent required, with all the tools, machinery and appliances necessary for the rapid prosecution of the work, we expect to complete the road ready for the use of the Government years in advance of the time prescribed by the law. All our energies will be devoted to this great enterprise until the iron highway shall span the American Continent.

LELAND STANFORD,
Pres't C. P. R. R. Co.

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1863 1913

AN ACCOUNT *of the* CEREMONIES ATTENDING THE INAUGURATION *of the* WORK OF CONSTRUCTING THE CENTRAL PACIFIC RAILROAD—THE WESTERN END OF THE PACIFIC RAILROAD—AT SACRAMENTO, JANUARY 8, 1863

AND

PROGRAMME OF THE CELEBRATION OF THE 50TH ANNIVERSARY OF THE EVENT AT SACRAMENTO, JANUARY 8, 1913

CALIFORNIA STATE LIBRARY

FOREWORD

Notwithstanding the necessity for such a line of communication had for years been repeatedly urged, it was not until 1859 that a bill was carried through Congress, authorizing surveys for three railroad lines to the Pacific Coast, namely, the northern, the southern and the central routes. The assumed impracticability of crossing the Sierras was the most discouraging feature.

There had come to California in 1854 a civil engineer, Theodore D. Judah, under whose administration was built the Sacramento Valley Railroad, from Sacramento to Folsom, the first railroad built in California. Through his initiative the California Legislature arranged for a convention to be held in San Francisco in September, 1859, to discuss ways and means looking to the construction of a Pacific Railroad. He was appointed by this convention to bear a memorial to the President, heads of Departments, and Congress, and to act as the representative of the convention in Washington. While there he assisted in drafting a bill on the lines recommended by this convention. The Civil War, however, delayed action in the matter.

Undismayed by difficulties, Mr. Judah succeeded finally in interesting the original incorporators of the Central Pacific in the project of building a road, and was employed by them to make a preliminary survey for a railroad across the Sierra Nevada Mountains, from the City of Sacramento to a point on the Truckee River at the eastern base of the mountains, and as the result, the Central Pacific Railroad Company of California was organized under the laws of California in July, 1861. He crossed the Sierras twenty-three times on foot and on horseback, by way of exploration, in his effort to find not only a feasible route, but the most practical one. To his indefatigable efforts was largely due the final passage of the Pacific Railroad Bill — which included as its western end the Central Pacific Railroad—by Congress. Mr. Judah died November 2d, 1863.

The Pacific Railroad Bill was passed at the second session of the forty-second Congress, 1861-62, after long discussion, and became a law by the signature of Abraham Lincoln, President of the United States, the first day of July, 1862, and was entitled "An act to aid in the construction of a railroad and telegraph line from the Missouri River to the Pacific Ocean, and to secure to the Government the use of the same for postal, military, and other purposes." The Civil War being in progress, the treasury was subjected to an enormous strain, and Congress was engrossed with the work of devising new systems of finance and taxation to meet the dire emergency. To build the road, the Sierras had to be scaled; material for construction had to be brought 20,000 miles by sea and land. Labor was difficult to get. It was built with pick and shovel, with dump-cart and with the use of black powder. Never since history commenced her record of human events had she been called upon to note the beginning of a work so magnificent in conception and so marvelous in execution.

President Lincoln's View

¶ President Lincoln said when approached by Representatives in Congress who urged that the Government should do the work of building THE PACIFIC RAILROAD: "The National Government has its hands full in carrying on the war. Private enterprise must build the Pacific Railroad and all the Government can do is to aid, even admitting its construction is a political as well as a military necessity."

Pacific Railroad Inauguration
Formal Opening of the Work

Addresses by Gov. Stanford, Judge Crane, Rev. Dr. Peck, Senator Van Dyke and Others

(From the Sacramento Daily Union, Jan. 9, 1863.)

The skies smiled yesterday upon a ceremony of vast significance to Sacramento, California and the Union. With rites appropriate to the occasion, and in presence of the dignitaries of the State, representatives of every portion of the commonwealth, and a great gathering of citizens, ground was formally broken at noon for the commencement of the Central Pacific Railroad—the California link of the continental chain that is to unite American communities now divided by thousands of miles of trackless wilderness. Among the assemblage were pioneers, who had assisted in laying the foundations of the Golden State, who had dreamed, toiled and schemed for years in behalf of this grand enterprise, and clung with steady faith, through many depressing defeats, to the belief that they would live to witness the consummation of their hopes; men who had more recently determined to devote their energies and their means to the execution of the project; representatives of the various sections of the State who appreciated the importance of the work to the whole Pacific Coast, no matter where the line should be located; high officials whose presence and earnest approval enhanced the dignity of the occasion; divines to invoke blessings on the work; and last, but not least, directors and contractors, who gave substantial assurance that the brain, the muscle, the gold and the iron were ready to make the railroad a reality. A noticeable feature of the inauguration was the patriotic character it assumed. The orators ascended from the level of material considerations to the contemplation of the work as a "bond of Union," and took occasion to rejoice over the recent declarations that henceforth the Union is to be indissolubly wedded to Liberty. All such allusions, together with incidental references to the dignity of the free labor that was to build the continental railway, were received with enthusiasm and applause by the assembled crowd.

The choice of scene for the ceremony was not favorable to the presence of the gentler sex, but the balconies opposite—on Front street, above K—were adorned with a fair delegation. The great preponderance of pantaloons was a disagreeable necessity of the "situation."

A stand was erected near the levee, a short distance above K street, and the ends were adorned with the national flag. A general distribution of bundles of hay gave a comparatively dry footing to the crowd in the immediate vicinity. The Sacramento Union Brass Band was stationed on the balcony of the American Exchange Hotel, and between the addresses enlivened the proceedings by playing the national airs and the peculiarly appropriate "Wait for the Wagon." Two wagons adorned with flags, drawn by horses that were also decorated with the national colors, were stationed near the rostrum, with earth ready to be shoveled out for the railroad embankment. On one of these wagons was a large banner bearing a representation of hands clasped across the continent from the Atlantic to the Pacific, with the prayer of every loyal heart,

"May the Bond be Eternal."

Shortly after twelve o'clock noon Governor Stanford appeared upon the stand, and the ceremonies of the occasion were commenced.

Charles Crocker introduced to the assemblage Leland Stanford, Governor of the State of California.

GOVERNOR STANFORD'S SPEECH

Fellow Citizens: I congratulate you upon the commencement of the great work which, in its results to the State of California and the Pacific Coast, and to the nation itself, is to be what the Erie Canal was to New York and the Western States. The work will go on, from this side to completion, as rapidly as possible. There will be no delay, no backing, no uncertainty in the continued progress. We may now look forward with confidence to the day, not far distant, when the Pacific will be bound to the Atlantic by iron bonds, that shall consolidate and strengthen the ties of nationality, and advance with giant strides the prosperity of the State and of our country. The blessings which are to follow the completion of the work which we this day inaugurate cannot be fully estimated. Agriculture, commerce, manufactures, wealth and population will feel its influence, and will commence with it a new era in progress. And we may rest assured that the results will be equal to the magnitude of the undertaking, which is one that will shed lustre upon the enterprise, the energies and the wisdom of our people. A few short years since, the pioneers of our State looked upon a field magnificent, but wild and unexplored. The beautiful river at our side floated upon its bosom only the light canoe and reed raft of the untutored native. But, under the stimulus of American energy, how changed this scene. The stream from its hitherto clear and undisturbed repose, is changed to a busy channel bearing the evidences of labor in the eastern hills. With the pioneer appeared upon its surface the heavy and cumbrous barge, followed by the slow sailing craft, and soon by the noble steamer freighted with the wealth of a prosperous State, and alive with travelers urging that prosperity to its farthest limits. The Pacific Railroad will insure still another change; the wealth and the commerce of the East and the West is to float upon its waters, and it is to behold the busy denizens of the two hemispheres in the constant travel over the great highway of nations. It is to realize all this that we are assembled here today, and we should be happy in the enjoyment of so great and glorious a privilege. I feel honored that the ground in the progress of the construction of the Pacific Railroad is first broken by my hand; and as emblematical of the importance of the work, and of its appreciation by the people of the State, and their determination to perform what is now undertaken, it is meet and proper that the Governor of the State should be present and perform the first act of labor, and that we should invoke God's blessing upon the undertaking.

At the close of the Governor's remarks, Rev. J. A. Benton came forward and offered the following prayer:

PRAYER BY REV. J. A. BENTON

Oh, Almighty and Everlasting God! who ridest upon the wings of the wind and makest Thy pavilion round about the dark waters and thick clouds of the sky; who hast Thy way in the sea and Thy path in great waters; who didst speak and it was; who commandedst and it stood fast;

by the wonderful working of Thy hand, the heavens unfurl their banners, and the earth loads herself with fruits and decks herself with flowers. We bless Thee for the revelation of Thyself in all Thy works, and for that which Thou hast done, and for all Thy grace in permitting Thy creatures to discover the secrets of nature, and make use of so many of the appliances of art. We bless Thee for all the triumphs of art and civilization, for the steamers that plow the ocean, the locomotives that go with the speed of the wind, and the lightning which harnessed, runs to and fro to do the bidding of men. We bless Thee for all the knowledge given to us, Thy creatures. We rejoice that Thou canst make all things promotive of Thy cause and kingdom in the world, that cause which is the cause of humanity, and that kingdom which embraces mankind. We bless Thee for this propitious day, this happy hour which we have waited for and prayed for through the lapsing years. Oh God, grant Thy favor unto this enterprise; bless these directors and officers. May this enterprise, which is now inaugurated in Thy name, go on speedily to its completion. Thou didst command in the words of Thy prophet in the times of old, saying, "Go through, go through the gates; prepare ye the way of the people; cast up, cast up the highway; gather out the stones; lift up a standard for the people; prepare ye the way of the Lord; make straight in the desert a highway for our God; every valley shall be exalted, and every mountain and hill shall be made low; the crooked shall be made straight and the rough places plain. And an highway shall be there, and it shall be called the way of holiness; the unclean shall not walk therein; but it shall be for those, and the wayfaring men, though fools, shall not err therein." In our humble way, and in this material form, we enter upon the first step of creating a highway for the people and nation. Oh, Lord, deign to accept it as Thy work. Let "the wilderness and solitary place be glad for it, and the desert blossom as the rose." Let it be a source of power to this great nation. Unite the nation again into a power which shall guard the freedom of the world. Oh Lord, let this be a bond of connection between the East and the West, between those vast expanses of ocean; let Thy name be glorified amongst all the islands of the sea, and the inhabitants of this great commonwealth. May our city flourish, and be a city sought out and not forsaken; may the blessing of the Most High be poured out upon this work and all such enterprises, now and forever. Amen.

At the close of the prayer C. Crocker announced that "the Governor of the State of California will now shovel the first earth for the great Pacific Railroad." (Cheers.)

The two wagons loaded with earth were driven up in front of the rostrum, and Governor Stanford, with a zeal and athletic vigor that showed his heart was in the work and his muscle in the right place, seized the shovel, and amid the lusty cheering of the crowd, deposited the first earth for the embankment. The enthusiastic Charles Crocker promptly called for "nine cheers" and the crowd, sharing his enthusiasm, cheeringly responded. The sun smiled brightly, and everybody felt happy because, after so many years of dreaming, scheming, talking and toiling, they saw with their own eyes the actual commencement of a Pacific Railroad.

This ceremony ended, the Governor returned to the platform.

A. M. Crane of Alameda, President pro tem. of the Senate, was introduced and addressed the assemblage as follows:

SPEECH OF SENATOR CRANE

Fellow Citizens: I do not know what I can say to add to the interest of this occasion that has not already been an hundred times said, and better said than I can say. The great enterprise here this day inaugurated is the consummation of a long, arduous and finally successful struggle, waged often with faint hopes of success, persevered in against discouragements and obstacles of every kind, until finally success has crowned our efforts. This is an occasion on which we should gratefully remember the entire and laborious devotion of our delegation to both houses of Congress in finally securing the passage of the Act which is destined to commemorate this great and magnificent enterprise. The future—who shall predict it? and what language shall be used even in a faint degree worthy of the subject, or the occasion? San Francisco and Boston, the two distant extremes of our continent, will then be united by one continuous and unbroken iron track, of over four thousand miles. How magnificent the idea! What a triumph of human power, and what an honor to the civilization of our age! Between those two distant points passengers may be conveyed, at ordinary rates of speed, in the period of seven days. Starting from the metropolis of the Pacific Coast after an early breakfast, the passenger will lunch at Sacramento, and dine the same evening at Carson City. The rising sun of the next morning will find him half way between Carson and Salt Lake City, having during the night passed down the entire valley of the Carson and across the great desert, and on the evening of the second day he will dine at the wonderful City of the Desert. (Applause.) Having accomplished this first thousand miles, more or less, in thirty-six hours, our passenger, after the travel and rest of another night, will awake in the morning amidst the magnificent scenery of the South Pass of the Rocky Mountains—having passed during the night the mountain ranges lying between the great valley of Salt Lake and Green River, crossing this stream, passing up the valleys of the Great Sandy and Pacific creeks to the dividing ridge between the waters flowing to the Atlantic and Pacific oceans. As the sun of this morning shines forth, he will look out upon the most magnificent works of the Creator. Away to the northwest will appear the cloudy, snow-capped range of the Wind River Mountains—to the southeast the parallel ridges of the great Rocky range, rising one behind the other, displaying their whitened prominences, and in every direction the grand scenery of disjointed, isolated and vast masses of rock, will make full and complete the splendid panorama. Passing amid the grandeurs of this scenery down the valley of the Sweetwater, over the dividing ridge between that and the Platte River, he will dine on the evening of this day at Fort Laramie, and lying down to rest again, he will pass during the night rapidly down the great valley of the Platte, arriving on the following morning at an early breakfast at Fort Kearny. At this point, crossing and leaving this great valley, down which he has passed for so many hundreds of miles, he will pass over the emerald prairies of Nebraska and dine on the evening of his fourth day at St. Joseph—having thus reached the Missouri River in three days and a half from San Francisco. (Applause.) This is the same journey which the early immigrants to our coast, myself among the number, accomplished only after a laborious march of an hundred and more days; and we can now hardly realize the great change so soon to come, and which has been so imperfectly depicted. Nevertheless, it is a fact which will soon be upon us. It has been often, and again and again remarked, that we live in a wonderful age. This saying, from its frequent repetition, has become trite, but is none the less true. And yet how few of us really realize its truth. We are living in a wonderful, nay the most wonderful era in the history of our world. Since those of us now in the middle age, have been upon the stage, more and greater advancement has been made in all the arts of civilization and human progress than in three centuries before. An unseen, imponderable agent is made the conductor (no one has yet explained how) of thought, and from the farthest extremes of our country, now, day after day, as the conflict for freedom against barbarism and rebellion rages, we are informed of the tremendous conflicts, and battles lost or won, ere yet the dead are buried or the wounded cared for. (Applause.) The wonders of photography I need not allude to—that most accomplished and finished of all arts, by which the rays of our great luminary are forced into the service of man, and made to paint, severely true, all objects at will. Other and former eras have been characterized as the age of bronze, or the age or iron—of gold—of steam—of thought—of right; and after near a century of abasement and shame, our nation has now entered also upon the age of liberty. (Applause.) Let us for the moment glance at some of the most immediate benefits which are to accrue to the people of our own State from the construction of this great work. These benefits we shall begin to realize from the commencement. So soon as a section of the road is placed in working order its advantages will become apparent, and the farther it proceeds the more and greater will these advantages become. Our yet scarcely developed mineral resources will receive a new impetus, and thousands of tons of ores containing the precious metals will be weekly delivered at extensive metallurgical works, yet to be erected here or at the bay, by means of which, by more perfect

machinery and higher appliances of art, the metals can be extracted more perfectly and with greater economy. By this means also millions of tons now esteemed worthless, in the usual modes of working, will be reduced at a profit. The copper ores now being so abundantly discovered will be rendered of increased value by the economy of transportation, and the low grades of those ores, now abandoned as worthless, will for the same reason be made available, and found to contain fortunes. The coal of our Coast Range will be afforded at low rates to the consumer; the granite and marble and other building rocks will reach the centers of trade, and contribute to the erection of our cities and the adornment of our public edifices; and the timber of our mountain forests be rendered accessible for all the purposes of civilized life. Vast tracts of land, now lying in its virgin fertility, owing to the remoteness of markets, will be brought into cultivation. Our main centers of commerce will become the recipients of enormous increase in every branch of business, and more especially manufactures will be encouraged and become promoted to an extent hardly to be conceived, and thus employment and fair remuneration be afforded to thousands. The facility of rapid communication, bringing as it were the city and country together, will lead to the development of many as yet unknown sources of wealth, and will induce capitalists to invest in enterprises now deemed unfeasible. When this great work shall be finally accomplished, and the iron track shall become a continuous highway across the continent, then the impetus to commerce, both domestic and foreign, that will follow can hardly be conceived, and from this our State will reap a golden harvest. There will be saved to us and Nevada Territory annually at least three millions of dollars, which would otherwise be charged for freight and insurance, under the name of exchange, on the hundred millions we shall annually export of gold and silver. The country to be opened to civilization and settlement, lying between the Rocky Mountains and the Missouri, is of vast extent. The Territory of Dacotah alone (which by branches from the main road will eventually be penetrated in all directions) is nearly as large in its extent as all the Southern States now in rebellion. Here are yet to be the happy homes of millions, and from it a cluster of new States will be added to the galaxy of our mighty republic. (Applause.) I need not speak of it as an arm of national defense, nor allude to the rich commerce of the Indies and South Sea islands, nor to the entire change in the trade and travel of the world which it will effect. These have all been so often and so well presented by others—more ably than I can do it—that it would be but a waste of time to reproduce them. All that has been said, and more, now approaches its realization. A few years only will elapse—probably within the lifetime of the largest portion of those present today—and what has been now commenced will be completed. Another great fact will then be added to the world's history. Then with truth we may say,

"No pent-up Utica contracts our powers;
The whole boundless continent is ours."

(Applause.) Then will be celebrated an event. New York, Boston, Baltimore, Philadelphia, Cincinnati, St. Louis, Chicago—all united to Sacramento and San Francisco by iron bonds and golden links—meeting by their delegations our own, amid the grandest of Nature's scenery, will hold a jubilee of triumph at Pacific Springs, and engrave upon the great granite face of Independence Rock their memorial of the completion of this greatest, proudest achievement of man. Our sister city of the Bay will then, rapidly developed by the amazing increase of her commerce and manufactures, pass beyond any at present conceived limits, and sit proudly the queen of cities. When this great event shall become historic—notwithstanding the strides in human progress yet to be made—it will be looked upon as the grandest work ever accomplished in the world's history, and side by side in this country, to future ages, shall stand forth two great events—the completion of the most gigantic national work ever undertaken by man, and the dedication anew through blood and fire of our whole country, as the land of freedom and free men. (Applause and cheers.)

SPEECH OF J. H. WARWICK

J. H. Warwick of Sacramento, member of the Assembly, was introduced and said:

Mr. President, Ladies and Gentlemen: It is with a feeling of awe and almost of reverence that I rise on the present occasion. As I look upon the beginning of this mighty work, as I catch a glimpse of the opening secrets of the mystic future, I feel overpowered and awestruck at the magnificent contemplation. This age, pregnant with great events, startling with its present wonderful realities, mighty for its genius, glorious for its revelation of unwavering loyalty and martial power, is the mother of no work more splendid or enduring than that which we inaugurate today. When, five and twenty centuries ago, the immortal Roman marked with his plowshare the bonds of the imperial Mistress of the World, how little did he dream of the

coming greatness, the dazzling splendor, the heroic achievements, and the glorious memories of the mighty empire whose cornerstone was then and there being laid. How little did he dream that a splendid empire should spring into active and vigorous life, that it should run hrough its course of glory and greatness for more than a thousand years, that the splendid columns of the Olympian hill should crumple to ruin and decay—that the Coliseum, once crowded with delighted thousands, should be deserted and silent and lone; and after all these were ashes and dust—with their glories departed and gone—that the memories of her heroes, her statesmen and her scholars, should survive the inevitable wreck. We stand now upon the threshold of an era fraught with consequences no less tremendous, encircled with hopes no less alluring; heavy with portents which no priestly interpreter can truthfully and clearly explain. With conceptions bold and vivid and clear, I doubt if there is one who hears me today who realizes in its broadest and fullest achievement the magnificence of the present undertaking. The mighty work before which hills shall be cut down and valleys shall be exalted; on whose completion distance shall be annihilated; before which mountain barriers and desert sands shall disappear as if touched by the magical wand of the enchanter! The iron band that links us with our childhood's home is in itself a splendid achievement; but far beyond and above any such consideration is the glory of the present undertaking. What dazzling streams of future greatness rush upon the imagination, as we contemplate the future of this mighty work; what cities crowded with teeming thousands; what towns and hamlets and villages and homes shall rise into life on its magical track; what wealth now lying down deep in the bowels of the earth shall this highway of nations bear to the marts of the world; what thankful hearts and boundless blessings shall enshrine it among the glories of the time; what undying benefits shall it confer upon our race, when the wilderness shall be made to blossom as the rose, and the desert shall echo with the voice of busy millions! (Applause.) Side by side in this marvelous age are the triumphs of peace and the triumphs of war. On the one hand we behold embattled legions closing in the fierce grapple and the death strife; and on the other the mightiest modern achievement undertaken and urged to its speedy completion. Over the road which we dedicate today the silks of India, the rich tribute of China and Japan, the gold, the wine and the wool of Australia, the treasures of California, and the spices of the East shall roll in a mighty tide of wealth such as mankind has never realized before. The stormy horrors of Cape Horn shall be forgotten; the sickly terrors of the Isthmus cease to be remembered, and undismayed by the Cerberean sentinels whose watchful vigilance and jealous care have guarded and protected her treasures, the fires of an hundred nationalities shall blaze on the hills and in the valleys of California. I hear a voice rise from yon mountain barrier, telling us that ere long the name of Nevada shall be engraven on the thirty-fifth star which enhances the glory of the American constellation. (Applause.) Nevada, the younger sister, and I might almost say, the child of California—Nevada, whose rise to dizzy greatness has been almost equal to our own—Nevada, whose exhaustless wealth has startled and amazed the world. We seek to lock her in a nearer, a dearer, a closer and more fraternal embrace. What the genius of the world may produce in the future no one living can foretell. The ingenuity of man, triumphing over the battling elements, may guide his bark safe on the tempestuous sea, or undismayed by the terrors of the clouds, steer his aerial car in the track of the sun — where, Phoebus-like, looking down from his imperial height, where the swift-winged eagle dreads to soar, he may laugh at the lightning's flash and revel above the thunders of the storm. The dome of the Capitol may crumble into dust; our cities be deserted and silent and alone. Our nationality, purchased by such countless treasure, endeared by and embalmed in such costly blood, may be ruined and destroyed by ingratitude and treason; the name of American, once so proud, may be borne by the pariah, the coward and the slave; the high hopes which humanity conceived from our greatness, be extinguished in darkness and blood—and when all these have passed away, the scattered fragments of this mighty work on mountain top and desert sand shall tell of a people whose genius time could not parallel—whose indomitable energy no obstacle could crush. The day which you have selected for this dedication comes fraught with the most glorious memories. On this day forty-eight years ago our fathers on that sacred spot where, thank God, the flag of the free is floating still, drove the oppressor from the soil and ransomed with their blood their native land from the grasp of the invader and the spoiler. (Applause.) In close proximity with this holy day comes another—comes another which shall be forever memorable in the annals of this nation—the first of January, in the year of our Lord 1863; that day which shall stand on the nation's history like a shrine to which liberty's pilgrims from every land shall turn with undying devotion. The first of January, 1863, when Abraham Lincoln, God bless his name, proclaimed liberty throughout all the land, and to all the inhabitants thereof. (Cheers and applause.) Yes, let the glad winds proclaim to all the people of the earth that this Republic, the hope of humanity in every clime, the last home and abiding place of freedom, is redeemed from the great curse that soiled her escutcheon, that blackened her honor, that

sullied her fame; and if in the struggle in which she is engaged her greatness and her glory must perish, all coming time must honor the Republic that only fell by the hand of the assassin, that perished in the cause of human liberty, that died in defense of human right. And now may Almighty God bless the work which is here undertaken today. May it become a pride, an honor and a glory to the land, and may He who guideth the wind, who ruleth the storm, and who holdeth the sea in the hollow of His hand, preside at the councils of the nation and protect her soldiers in the field. May He guide us forever and forever, and may that word liberty, which has filled the hearts of stricken millions in our land, and raised them to the condition of men, be engraven upon every banner of our army, and be carried before them, a cloud by day, a pillar of fire by night, guiding them onward to glory and victory. (Cheers.)

SPEECH OF J. A. BANKS

J. A. Banks of San Francisco, member of the Assembly, was next introduced. He said:

Fellow Citizens: These clear skies and this genial sunshine are all emblems of the glowing hope that must animate every true Californian's heart at this auspicious moment. We are here to inaugurate that great work for which we have so long hoped, and prayed, and labored. We have had in glowing terms pointed out to us the magnificent future that must ensue upon the commencement, or at least upon the partial completion of this great work. We need not look to the final completion of the Pacific Railroad for the realization of many of these hopes which we can justly entertain. The great fact that the Pacific Railroad is, is sufficient to enhance the prosperity of our State an hundred fold. That fact makes our commercial emporiums in prospective the mightiest of any upon the globe. It gives us the assurance that in a few short years the Pacific will be bound to the Atlantic by bonds of iron that may never be broken. (Applause.) We have, in this contemplated work, the assurance that the political bonds by which the two extremes of the country are united shall be cemented in such a manner that they never can be dissolved. The Pacific Railroad is for all coming time the death blow to the idea of a Pacific Republic (cheers), and gives us the assurance that in a few short years we will be strengthened by a closer union in the bonds of affection which united us to the people of the Atlantic States. Soon, drawn by the iron horse, we shall glide over the snow-capped Sierras and over the sandy plains of the desert, and shall be able in a comparatively short space of time to visit our dear friends, the old folks at home. (Applause.) It is not for me on this occasion to review the many advantages to which reference has already been made in such eloquent language. I stand here simply for the purpose of mingling my feeble congratulations with yours in the contemplation of the near approaching completion of this great work. But while we unite in these congratulations, and while we dwell upon the magnificence of the achievements which will result from this work, let us not forget that the day for fine paragraphs, the day for sounding phrases and allusions to glory, has now given place to the day for actual work. Let us remember that those results upon which we dwell with such rapture must be achieved by our heads, our hands and our purses. (Applause.)

SPEECH OF WALTER VAN DYKE

Walter van Dyke, Senator from Humboldt county, was introduced, and said:

Mr. President, Fellow Citizens and Gentlemen: This work which you have inaugurated here today is one in which the whole people of California are concerned, and not alone the citizens of Sacramento—not only the people of California, but those of the Pacific slope; and inasmuch as the people cannot congregate here to participate in the inauguration of this great work, it is perhaps meet that their representatives should express their joy. It is for this, Mr. President, I presume, that I am called upon to unite in this demonstration. Certainly I am not prepared to say anything to satisfy you of its great importance; but it is to represent those who cannot be here from the extreme northern part of the State, in wishing that this work may be speedily pushed forward to completion. This Pacific Railroad, Mr. President, in its effect upon the people of the Pacific slope, physically and politically, cannot be estimated. We, by this road, will secure that trade which other nations for years and centuries have struggled to monopolize—the trade of the Indies. All those nations that have secured it to themselves have reaped a rich harvest therefrom. Politically, it settles the fact that we will be indissolubly united with our brethren on the Atlantic slope. This great enterprise should have been undertaken years past, but from a singular infatuation of the people of this coast we clung to the aristocracy of the South which invariably repelled every practical proposition to inaugurate this movement. They have opposed this great undertaking. When the administration of the Government changed into other hands, into hands

that represented the wishes of the people instead, then this great work was at once put into practical shape, and here, today, you have inaugurated the Pacific Railroad itself. We have had speeches and newspaper articles ad infinitum; henceforth, we want the strong arm and the capital. This is what the people want now; and it is but a short time hence before their wishes will be gratified, because no reasonable man can doubt the success of this undertaking. Mr. President, as I remarked, I was called upon here unexpectedly, and having performed the duty which I supposed I was called upon to perform—expressing for my constituents the gratification we feel at this auspicious inauguration—I will leave the stand for other gentlemen. (Applause.)

SPEECH OF THE REV. J. T. PECK.

The Rev. Dr. Peck was introduced and said:

Mr. President and Fellow Citizens: Strange combinations are here. Only part of them are visible to us. I unite with you to honor so much of these combinations as I can see, and so many as I can think of. I honor the president of this corporation, and the secretary of the trustees; I honor every man who has had a strong thought and an energetic will to bring the work to its inauguration. I intend to honor, and I know my fellow citizens will unite with me to honor, all the men who embark in this enterprise their means, their intellects, and their muscles; for, fellow citizens, I cannot forget that there must be besides all the thought, and all the philanthropy and all the patriotism, and all the genius combined in energetic procedure, there must be muscle brought into action, and such muscle as has been finely symbolized and represented by our honorable Governor. (Applause and laughter.) I was pleased to see the Governor with the spade in his hand; not only because it indicates the formal inauguration of this great enterprise, but because it is a hint that it is honorable to labor. (Applause.) I honor not only the elements which will combine in the physical structure which we inaugurate today, but I honor the combinations which have come to this result. I tell you that it is not quite easy for any man to appreciate what the precedents, what the necessary antecedents of this day's work have been. Those who are active in the work of building this railroad are not alone concerned in its structure. I insist that the first pioneer who found his way across the desert and took his position upon this coast and opened his eyes and then lifted up his hand, and then let the light of his mind flash across to the Atlantic coast, telling of the beauty of this clime and the wealth and the glory of the Pacific, organized the Pacific Railroad. (Applause.) And I claim the honor, besides, for every pioneer who followed in his track and who, here experiencing pioneer life, undertook to lay the foundations of a vast empire by sacrifice and toil, and intellect and industry. I claim that there was work done for the formation of this railroad, and has been, by every hard-handed miner who has taken out of the recesses of nature and out of the confines of the rocks and the mountains the gold which will finally build it; and I will mention him today here. And I honor besides every hardy agriculturist, and every ingenious mechanic, and every determined, hard-handed laborer, who is concerned in the building up of this great coast, and the structure of this iron bond. But, my fellow citizens, is this all? I cannot omit to say that I honor every lady who has come to this coast as a pioneer, and to give her refining and genial influence to society here, as having made an invaluable contribution to the realization of this work in which we are now engaged. (Applause.) Shall I say all this and omit to say that I reverence and adore the Providence that has presided over all this enterprise, the God who made the State in which we live, the Great Being whose providence hid away the gold in the mountains until the set time had come, and who pushed forward the enterprise of the pioneer settlers of this country? And the Being whose power has been magnified and developed in the industry and energy of this corporation has been reverenced and adored; He is the Providence over all and before all, and in all of the great enterprises of this country; He now deserves to be reverently and adorably recognized. I trust that that Providence is here to preside over this inauguration. We can do nothing without it. The commerce of the continent, not less than the ocean, inland not less than foreign, requires His presiding providence and His kind care. That is to be seen in the future. He made the ground on which our road is to be constructed. He made the iron and timber of which the structure will consist, and His arm will be stretched out to control the material agencies of this structure. He made the minds, and he has endowed the minds of this age with the genius and power that will be developed here. He, the God we adore, and under whose fair sky we this day assemble, has brought together the strange confluent event in history—the consummation of this age and this hour, which is to be realized in the structure of this road. I humbly join in the fervent invocation of His blessing. Let us remember Him, depend upon Him, adore Him and obey Him, and all shall be well. (Applause.)

SPEECH OF WILLIAM H. SEARS.

William H. Sears, Assemblyman from Nevada, was the next speaker. He said:

Mr. President, and Ladies and Gentlemen: The invitation which I received but a moment ago to address you was, to me, very unexpected; in fact it so surprised me that I feel myself completely unnerved. But I would be a poor man indeed if I had not one word to say for this great enterprise. In speaking of it I am reminded of that other great cause which has always been the companion of the Pacific Railroad—the friends of the railroad have always been the friends of freedom. (Applause.) The friends of slavery restriction have always been found supporting the Pacific Railroad bill, and I thank God today that, like all great measures and great truths, they have both recently been triumphant. Today we have met to celebrate the railroad, but California has a double occasion for pride, for she has been the first State in this Union to indorse the one great measure and the first State to practically inaugurate the other. (Applause.) And there is another significant fact in this connection, namely, that our Governor is the President of the Central Pacific Railroad, and, ladies and gentlemen, he has shown you today that he is a practical free soiler. (Applause and laughter.) Now, fellow citizens, let the great work go on. As represented there upon your banner, let the cars fly from ocean to ocean, like a shuttle through the great loom of the States, weaving a fabric so strong that it will cement forever the commercial, social and political friendship of the United States. Gentlemen, spades are trumps: Labor is King. (Great cheering.)

SPEECH OF NEWTON BOOTH.

Newton Booth, Senator from Sacramento County, was introduced and spoke as follows:

Fellow Citizens: What does the symbol upon that banner mean? Those grasped hands? What do they signify?

Mr. Crocker—May the bond be eternal!

Mr. Booth—Yes; "May the bond be eternal!" eternal between the Pacific and Atlantic. But does it not mean something more? Through this bond that is to be made shall not Europe and Asia shake hands across this continent? (Applause.) Why, you remember that the theory of Columbus was when he set sail, that he was in search of a pathway to India. That pathway is found. Here it will lie. (Applause.) And in connection with improvements which are yet to be made in navigation, when the great leviathans shall carry their floating cities upon the deep, Europe and Asia shall here meet in the bands of commerce and of intercourse that shall be eternal. This, then, inaugurates a new era in civilization—a new era in trade and commerce. Its beginning is small, but nature and art always work from small beginnings, through laborious means, to magnificent results. The little acorn is cast into the ground, but after a hundred years behold the oak! It was a little thing when the Egyptian king laid the cornerstone of his pyramid; now thirty centuries look down from its summit! You, sir, today have inaugurated a more glorious work—a work whose beneficent influences shall last when the names of Egyptian kings and dynasties shall be forgotten. Hail, then, all hail the auspicious hour! Hail this band of brotherhood and Union! Hail this marriage tie between the Atlantic and the Pacific! Hail, all hail, this bow of promise, which amid all the clouds of war is seen spanning the continent—the symbol, the harbinger and pledge of a higher civilization and an ultimate world-wide peace! (Applause.) On the 4th day of July, 1876, one hundred years after the declaration of American independence, this magnificent work will have been completed. Then the day of jubilee so eloquently described by one of the first speakers will indeed arrive, but in the multitude that will meet around Independence Rock will be not only the inhabitants of New York, and Boston, and Chicago and St. Louis, but the people of New Orleans, and Savannah, and Charleston, and representatives of all this great country, then free, united, happy, and peacefully reposing beneath yon starry folds. (Cheers.)

SPEECH OF J. F. MORSE.

Dr. Morse was introduced with the words, "Gentlemen, Dr. Morse has no need of an introduction to this crowd." (Applause.) He said:

Gentlemen and Fellow Citizens: There are some sources of inspiration whose thrilling power speaks to the mind and heart with such force that we look in the vast vocabulary of words in vain for the vehicles through which we shall respond in a fit manner to our own wishes and the necessities of the occasion. We have all felt that which prompted us to be present upon the great occasion of commencing the work which has been so eloquently and

appropriately alluded to in the speeches which have already been made. I do not feel that it would be possible for me under the circumstances to do more than congratulate that small body of pioneers of 1849 with whom I have the honor of being associated upon the very auspicious day which has opened to their happiness. This day, gentlemen of our association, we have a delegation who have gone below to San Francisco for the purpose of commingling with them in the ceremonies of dedicating a hall, sumptuous in all its appointments, to their special necessities and wants. We are here, those who remain in this city, faithful to the instincts of their nature, which brought them here at so early a day, to lose nothing in the opportunity which is here offered of participating in the still greater ceremonies of dedicating to humanity and to God the greatest enterprise on which the mind of man was ever called upon to center its contemplation. With these remarks, ladies and gentlemen, I thank you for the compliment you have paid me, and hope that we may all live to enjoy the blessed privilege of visiting our kindred by this means of communication. (Applause.)

SPEECH OF CHARLES CROCKER

Fellow Citizens: It becomes my duty now to tell you that the exercises are about to close, but as I have had no say in this matter yet, I propose to say a few words. ("Go on!" "Go on!" and applause.) You have listened to the address of the Governor of the State of California; you have heard the eloquent prayer of the divine who addressed the Throne of Grace and called down the good will of Heaven upon our undertaking; you have heard the eloquent strains of the statesmen of California, as they have regarded the commencement of this work; you have heard statesmen and divines say all they have to say. Now, then, the talk is through, and now the labor commences. I tell you, fellow citizens, it is the proudest day of my life when I can say to my assembled friends here that it is my duty to assist in the inauguration as one of the actual laborers in this great enterprise. ("Good" and applause.) Allow me to say to you today that the arrangements are all made; that this is no idle ceremony; that the pile-driver is now, while I am talking, driving piles for the foundation of the bridge across the American River. (Great applause.) Tomorrow morning one of the sub-contractors, who owns these teams, and has brought this earth here to deposit at the commencement of this road, will proceed across the river and commence the labor of grading. It is going right on, gentlemen, I assure you! All that I have—all of my own strength, intellect and energy—are devoted to the building of this section which I have undertaken. (Great applause.)

PROGRESS OF WORK BUILDING

THE

CENTRAL PACIFIC RAILROAD

Broke ground at Sacramento	January 8, 1863
Laid first rail	October 27, 1863
Sacramento to Roseville	Constructed in 1863
(18 miles)	

Road opened as follows:

To Newcastle	31 miles,	January, 1865
Auburn	36 miles,	May 15, 1865
Clipper Gap	42 miles,	June 10, 1865
Colfax	54 miles,	Sept. 4, 1865
Secret Town	66 miles,	May 8, 1866
Alta	78 miles,	July 10, 1866
Cisco	94 miles,	Nov. 9, 1866
Summit	105 miles,	July, 1867
State line	278 miles,	January, 1868
Reno	294 miles,	May, 1868
Wadsworth	329 miles,	July, 1868
(Constructed 362 miles during 1868)		
Monument Point	667 miles,	April 15, 1869
Ogden	743 miles,	May 10, 1869

Driving last spike—and opened up for business from Sacramento, May 10th, 1869.
(San Francisco to Ogden [per Time Card] 883 miles.)

PROGRAMME

of the

CELEBRATION OF THE FIFTIETH ANNIVERSARY OF THE INAUGURATION OF THE CONSTRUCTION OF THE CENTRAL PACIFIC RAILROAD BY RETIRED RAILWAY EMPLOYES AND COMMERCIAL BODIES

at

SACRAMENTO, JANUARY EIGHTH, 1913

BEGINNING AT 12.45 P. M.

JOHN T. SKELTON, MARSHAL

EXERCISES AT FRONT AND K STREETS

OPENING ADDRESS . . . . . R. A. DONALDSON
On behalf of Retired Railway Employes

INVOCATION . . . . . REV. A. B. PATTEN
Pastor Congregational Church

MUSIC

UNVEILING MEMORIAL TABLET . . . . . BY MISS EVA LOWRY
The writer of the best essay prepared by ten female pupils of the Sacramento High School on the subject "What the Building of a Transcontinental Line Meant to Sacramento and California."

EXERCISES AT LADIES' TUESDAY CLUB HALL

INTRODUCTION OF CHAIRMAN . . . . BY R. A. DONALDSON

ADDRESS BY CHAIRMAN . . . . . W. H. CROCKER

MUSIC

ADDRESS . . . . . DR. DAVID STARR JORDAN
President Leland Stanford Jr. University

MUSIC

ADDRESS . . . . . GEN. N. P. CHIPMAN
Personal Associate of Prest. Abraham Lincoln

ADDRESS . . . . . HON. CHAS. E. McLAUGHLIN
On behalf of the Commercial Bodies

MUSIC

ADDRESS . . . . . WILLIAM M. BUNKER
On behalf San Francisco Chamber Commerce

ADDRESS . . . . . COL. JOHN P. IRISH
On behalf California Development Board

MUSIC

OTHER ADDRESSES

MUSIC

RECEPTION . . . . . BANQUET HALL

AT THIS POINT
January 8, 1863

GROUND WAS BROKEN INAUGURATING
THE CONSTRUCTION

OF THE

CENTRAL PACIFIC RAILROAD

THE WEST END
OF
THE PACIFIC RAILROAD

THE FIRST TRANSCONTINENTAL ROAD BANDING
THE CONTINENT WELDING THE ATLANTIC
AND PACIFIC COASTS AND THE ONLY
ONE BUILT FROM THE PACIFIC
COAST EASTWARD

DEDICATED BY RETIRED EMPLOYEES
JANUARY 8, 1913